RADIOLOGY

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EDITOR

Howard P. Doub, M.D.
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CONTENTS

ABDOMINAL ARTERIOGRAPHY. A REVIEW WITH AN ANALYSIS OF SEVENTEEN CASES. *David Shapiro, M.D.* 1

FULL-COLUMN TECHNIC IN LUMBAR DISK MYELOGRAPHY. *Leonard Malis, M.D., Charles M. Newman, M.D., and Bernard S. Wolf, M.D.* 18

THE CONCURRENCE OF PARIETAL THINNESS WITH POSTMENOPAUSAL, SENILE, OR IDIOPATHIC OSTEOPOROSIS. *Bernard S. Epstein, M.D.* 29

THE DIAGNOSIS OF VOLVULUS OF THE CECUM. *Herbert L. Abrams, M.D., and Warren A. Wass, M.D.* 36

GASTRIC VARICES. *John A. Evans, M.D., and Forbes Delany, M.D.* 46

BENIGN ULCER OF THE GREATER CURVATURE OF THE STOMACH. *Harold Feld, M.D., and Renzo G. Olivetti, M.D.* 53

LESSER SAC HERNIA VIA THE FORAMEN OF WINSLOW. *Christian V. Cimmino, M.D.* 57

RADIOLOGIC DEMONSTRATION OF AN INVAGINATED INTUSSUSCEPTED MECKEL'S DIVERTICULUM. *Brit B. Gay, Jr., M.D.* 60

RADIOGRAPHIC FEATURES OF URETEROCELE. *Charles Gottlieb, M.D., Samuel L. Beranbaum, M.D., and Richard H. Hamilton, M.D.* 64

CARCINOMA OF THE BREAST: ROENTGENOGRAPHIC TECHNIC AND DIAGNOSTIC CRITERIA. *J. Gershon-Cohen, M.D., and Helen Ingleby, M.B.* 68

CERVICAL RADIUM APPLICATORS WITH SCREENING IN THE DIRECTION OF BLADDER AND RECTUM. *Gilbert H. Fletcher, M.D.* 77

AUTOMATIC CASSETTE CHANGER FOR ANGIOGRAPHY. *Richard F. McClure, M.D., Howard P. Doub, M.D., and Richard E. Shipley, M.D.* 85

EDITORIAL: "LIFE IS SHORT, AND THE ART LONG; THE OCCASION FLEETING . . . " *Wendell G. Scott, M.D.* 90

ANNOUNCEMENTS AND BOOK REVIEWS. 93

RADIOLOGICAL SOCIETIES: SECRETARIES AND MEETING DATES. 97

ABSTRACTS OF CURRENT LITERATURE. 101

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Abdominal Arteriography

A Review with an Analysis of Seventeen Cases[1]

DAVID SHAPIRO, M.D.[2]

Louisville, Kentucky

THE USE OF A radiopaque medium for visualization of the abdominal aorta and its branches was first described by dos Santos, Lamas, and Caldas (1) in 1929, who reported on 300 cases without a death. In 1936, Henline and Moore (2), apparently questioning dos Santos' statement that blind puncture of the aorta in the paravertebral region was without danger, made an experimental study on dogs. They reported 5 deaths in twenty-one days, as a result of traumatic hemorrhage, and 3 deaths due to toxicity of the substance injected. The controls were poor, however, and the cause of death was indeterminate. Dos Santos properly pointed out that the arterial anatomy and physiology of dog and man are not comparable, and that experimental work on dogs is therefore valueless. Furthermore, Henline and Moore employed a dose approximately equivalent to six times that ordinarily used clinically.

This unfavorable report nevertheless delayed the acceptance of the method for many years, until 1941, when Fariñas (3) described catheterization of the aorta (*via* the femoral artery). In this country translumbar arteriography was first reported by Nelson (4) in 1942, with no serious incidents or sequelae in 73 cases. Melick and Vitt (5), in a review of some 3,000 cases reported up to 1948, could not find a single fatality recorded as directly due to the procedure.

Although the technic is exacting, it is fundamentally not a difficult one for qualified personnel. At first the indications were limited, but as experience has accumulated, with encouraging reports, the diagnostic significance and clinical scope are increasingly apparent.

TECHNIC OF THE PROCEDURE

The technic of abdominal arteriography as we have been using it, will be outlined. Complete details as to preliminary care, equipment needed, technic of injection, and after-care, have been adequately described elsewhere (6–8).

The patient is prepared in the same manner as for intravenous pyelography. Breakfast should be withheld, and appropriate premedication given for sodium pentothal anesthesia. We use no special test for iodine sensitivity, as in all of our patients intravenous pyelograms are part of the routine work-up, before abdominal

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[1] From the Department of Radiology, University of Louisville Hospitals (Veterans Administration Hospital and Louisville General Hospital, Louisville, Ky.). Presented at the Thirty-seventh Annual Meeting of the Radiological Society of North America, Chicago, Ill., Dec. 2–7, 1951.

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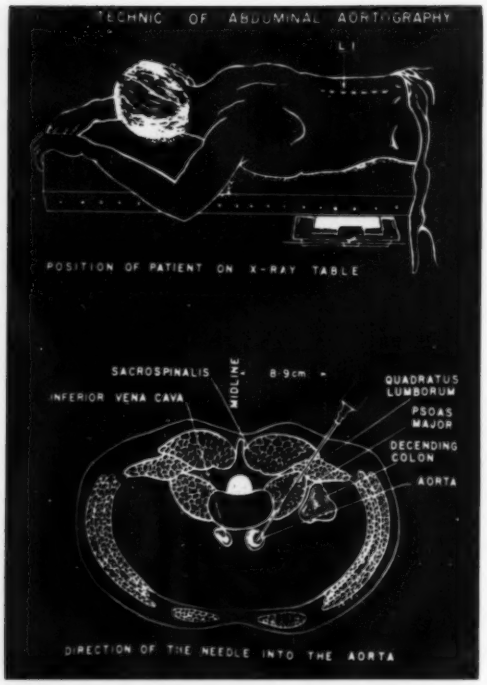

Fig. 1. Technic of abdominal arteriography.

arteriography is done. This appears to be the most practical test for such sensitivity. We would recommend that retrograde pyelography be combined with the abdominal arteriographic examination whenever possible in the study of renal lesions. We have found this especially valuable for the detection and study of aberrant renal vessels.

After arrival in the x-ray department, the patient is placed prone on the x-ray table, with the left side toward the operator. A 14 × 17-inch scout film is made to check positioning and roentgen technic. If the scout film is satisfactory, the patient is then anesthetized with sodium pentothal.

The skin of the back is properly prepared and the injection is made with an 18-gauge, 15-cm. needle. This needle is connected to the syringe by a short rubber tube, so as to avoid movement of the needle during injection, which might cause extravasation of the contrast material. The needle is inserted at the lower edge of the twelfth rib, about 8 or 9 cm. to the left of the midline (Fig. 1). The needle tip should enter the abdominal aorta above the level of the last thoracic vertebra, so as to avoid any of the abdominal arterial branches.

As for the contrast material, in most of our cases we have used 80 per cent sodium iodide. We believe this substance gives the best contrast on the films, and it is non-toxic. The solution is not entirely stable, as on aging some of the iodine may volatilize. However, fresh solutions appear entirely stable and safe. Satisfactory studies can also be obtained with 70 per cent Diodrast or Neo-iopax. Whatever the contrast material, 12 c.c. are used to fill the rubber connecting tube and syringe, and the injection should be completed in three to four seconds. As the final cubic centimeter is leaving the syringe, the signal to expose the film is given. With a properly ground syringe, and a needle of the recommended size, manual injection is rapid enough for good results. A representative normal abdominal arteriogram is reproduced in Figure 2, and a composite drawing of many such normals is shown in Figure 3.

Films of good quality may be obtained in the average patient by using 80 to 90 kv., 200 ma., and 1/10 to 3/20 second exposure time, with a target-film distance of 36 inches, high-speed Potter-Bucky diaphragm, par speed screens, and fast film. If the technic is such that a very rapid exposure is made, the study may not be satisfactory, as insufficient time may elapse for the contrast material to reach the peripheral vessels.

The needle is immediately withdrawn and a second film is promptly taken. This latter film may demonstrate the venous return or may show the nephrogram effect. If there is a failure, repeat arteriograms may be obtained safely the next day.

The patient is returned to bed after the procedure and given 1,000 c.c. of 5 per cent glucose in normal saline solution. Usually there are no complaints, and after several hours the patient may be allowed up and about, and on a normal diet.

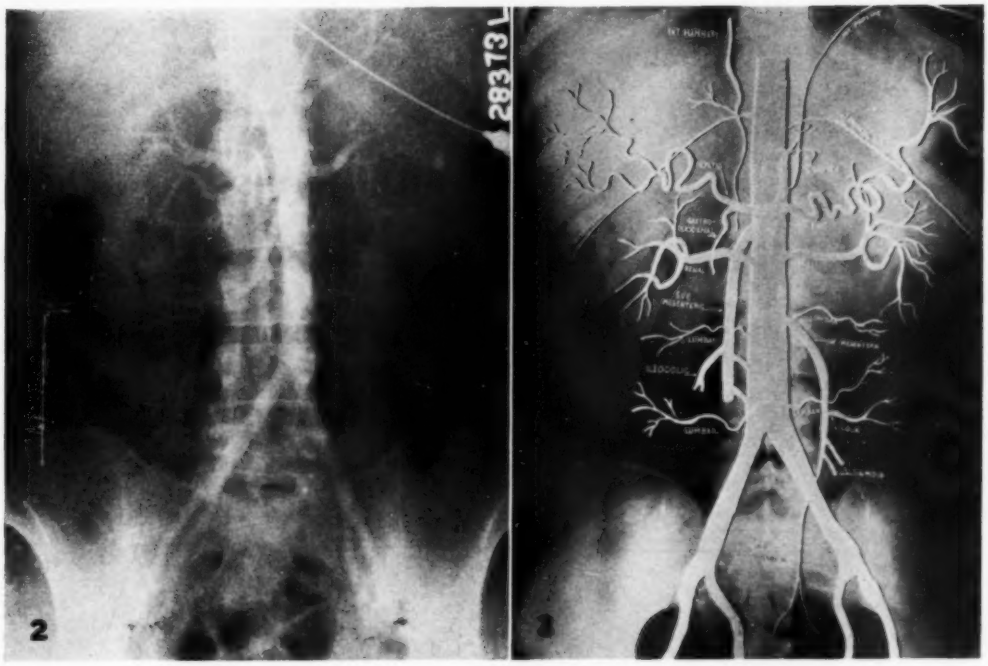

Fig. 2. Normal abdominal arteriogram showing the circulation to the abdominal organs.
Fig. 3. Composite drawing of normal abdominal arteriograms.

POSSIBLE COMPLICATIONS AND THEIR MANAGEMENT

1. Acute Iodism: On occasion, acute iodism has been reported, but in our own experience we have seen no evidence of this complication after using 80 per cent sodium iodide or 70 per cent Diodrast. This may be because of the routine administration of 1,000 c.c. of 5 per cent glucose in saline after every study. Elimination of the iodide ions by the kidney is hastened by the administration of chloride ions. In histologic studies of the arteries of the kidney removed immediately after the injection, there was no evidence of change in the intima or arterial wall from the sodium iodide (4). That this procedure is not a significantly toxic one is shown by the report of abdominal arteriograms done on 68 women during the late stages of pregnancy, without serious complications (9), and by the report of Melick and Vitt, mentioned above, of no fatalities in 3,000 reported cases. We do recommend, however, that every patient considered for abdominal arteriography have a previous functional renal study by an intravenous pyelogram; this will also serve as an iodide sensitivity test. The precautions advised for intravenous pyelography apply equally to arteriography; it should not be done in the presence of nephritis, uremia, severe liver damage, advanced tuberculosis, severe hyperthyroidism, or if the patient is sensitive to iodides.

2. Extravasation of the Contrast Material: Extravasation of the injected medium occurs not infrequently (Figs. 4 and 5), especially during the period when the operator is gaining experience. In our series there were no significant complications of extravasation. There may be some localized pain in the region after injection, but not always. Absorption of this hypertonic solution occurs in a fairly short time. In any event it is not advisable to drain the periaortic extravasation.

Fig. 4. Direct injection of most of the contrast material into the right renal artery; the aorta is faintly outlined. Note the nephrogram on the right. There is also some extravasation of contrast material around the point of the needle.

Fig. 5. Direct injection of the full amount of contrast material into the splenic artery. Note the extreme density of the spleen. There is also some extravasation of contrast material around the point of the needle.

Fig. 6. Direct injection of the contrast material into the superior mesenteric artery. Arrow points to a branch with serrated margins, probably due to spasm of this branch.

Fig. 7. Direct injection of the contrast material into the celiac axis.

3. Hematoma Following Aortic Puncture: We have seen no evidence of hematoma incident to aortic puncture, nor has it been reported in man, probably because of the tough, thick aortic wall and the fact that the needle enters the aorta in an oblique manner. In the many inadvertent aortic punctures that have been made during attempts to produce splanchnic blocks, we have found no report of such a perforation giving rise to complications. Many of our patients were arteriosclerotic and yet showed no complications such as hematoma or displacement of an arteriosclerotic plaque from the aorta at the puncture site.

4. Direct Injection into the Large Branches of the Abdominal Aorta (Splenic, Superior Mesenteric, etc.) or into the Inferior Vena Cava: We have seen the direct injection of the contrast material into a renal artery (Fig. 4), splenic artery (Fig. 5), superior mesenteric artery (Fig. 6), and into the celiac axis (Fig. 7). In none of these cases were there any permanently harmful effects, although direct injection of the full dose of contrast material into the superior mesenteric artery may result in gangrene of the bowel. In the case illustrated by Figure 5, the patient had symptoms simulating a "spontaneous splenectomy," but he made a complete recovery in ten days. On one occasion injection occurred directly into the inferior vena cava (Fig. 8); the patient stopped breathing for a few minutes, but after resuscitation showed no other ill effects.

There are two precautions to be followed that will obviate such mishaps as the above: (*a*) the needle point should enter the aorta above the level of the last thoracic vertebra, proximal to the origin of any of the abdominal arterial branches; (*b*) after the needle is in place, supposedly in the aorta, 2 or 3 c.c. of the contrast medium should be injected, and a film taken as the last cubic centimeter is introduced. This will show whether the material has entered the aorta or some other vessel (superior mesenteric or splenic artery). If the needle is in the aorta, the full amount of contrast material may then be injected safely.

Fig. 8. Direct injection of the contrast material into the inferior vena cava.

5. Extension of Arterial Thrombosis: Leriche (10) advises that patients with chronic thrombotic obliteration of the aortic bifurcation who are markedly overweight, or have signs of cardiac failure or cyanosis of the feet and legs, should not undergo abdominal arteriography. In such instances, the procedure may lead to the extension of the arterial thrombosis, with a fatal result.

INDICATIONS FOR ABDOMINAL ARTERIOGRAPHY

1. In Renal Diseases: The vascular pattern of the renal parenchyma in the normal state is typical. Abnormalities of this arterial pattern are usually significant. The number of arteries, and their points of entrance into the kidney, can be demonstrated by this technic. The indications are as follows.

(*a*) Renal agenesis: As proof to show absence of a renal pedicle.

(*b*) Hypoplastic or atrophic kidneys:

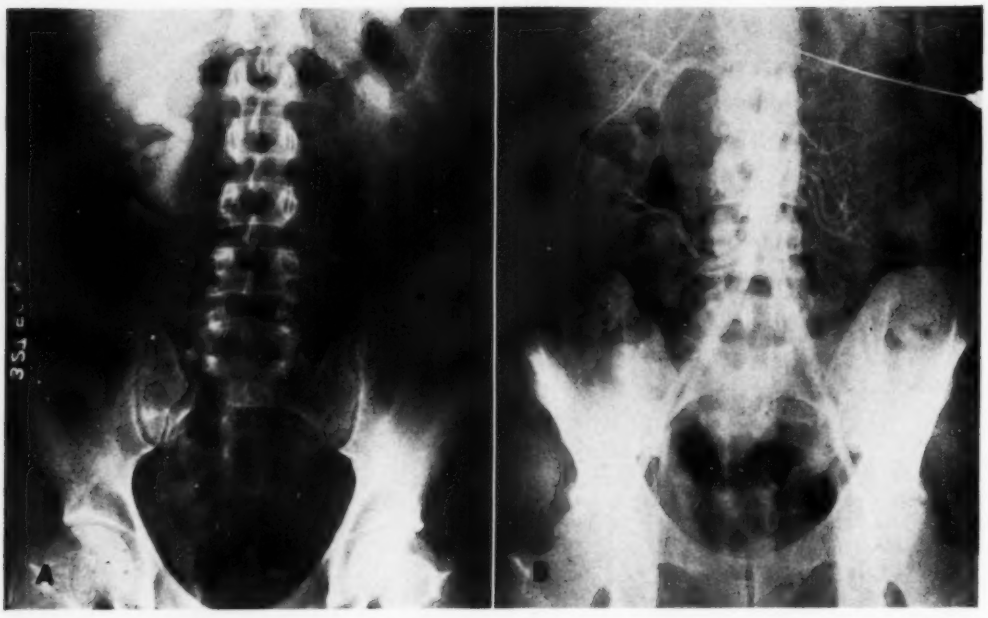

Fig. 9. A. Intravenous pyelogram showing on the right side a double renal pelvis, with moderate caliectasis and pelviectasis. On the left side, there is no renal shadow nor any visualization of contrast material.
B. Arteriogram of same patient, showing two renal arteries on the right, but no left renal artery. Note the well filled inferior mesenteric artery and its branches.

To demonstrate the blood supply, if any, to such kidneys.

(*c*) Renal ectopia: To show the source and amount of blood supply to the ectopic kidney, and the length of the renal pedicle.

(*d*) Horseshoe kidney: To show the arterial supply and point of entrance; also, what areas are avascular, as an aid in planning precise surgery.

(*e*) To demonstrate aberrant vessels to the normally positioned kidney.

(*f*) As an estimate of potential renal function in cases where there is failure of visualization with an intravenous pyelogram, though the kidney may have adequate blood supply (as in a long standing hydronephrosis), or where ureteral obstruction prevents obtaining a retrograde pyelogram.

(*g*) In some cases of hypertension, as a possible method to demonstrate the renal blood supply, to determine if the Goldblatt phenomenon is in effect (11).

(*h*) For the differentiation of renal tumors: In renal-cell carcinoma, typical staining, puddling, and laking are seen in the tumor sinusoids, and areas of necrosis. With cysts and papillary-cell carcinomas of the kidney, avascular areas are seen, with blood vessels displaced to the periphery. These latter two conditions may be differentiated further by retrograde pyelograms.

(*i*) To differentiate extrarenal retroperitoneal tumors from renal tumors.

(*j*) As part of a more detailed study of hematuria with normal pyelograms. Arteriography may show a small renal cortical tumor not otherwise demonstrable.

(*k*) To differentiate renal artery aneurysms from gallstones (with a nonfunctioning gallbladder), splenic artery aneurysm, and other intra-abdominal masses and calcifications.

(*l*) To demonstrate renal artery obstruction or aortic obstruction in the region of the orifices of the renal arteries.

2. In Diseases of the Abdominal Aorta and Its Branches:

(*a*) In the study of chronic thrombotic

Fig. 10. A. Retrograde pyelogram showing the right kidney to be somewhat larger than normal, but no other abnormalities. On the left side, the kidney appears smaller than normal, suggestive of renal atrophy.
B. Arteriogram showing a saccular aneurysm of the proximal abdominal aorta. The right renal artery appears normal, but the left renal artery is not visualized. Note the well filled splenic artery.

obliteration of the aortic bifurcation (the Leriche syndrome) (10, 12), not only can the site and extent of the occlusion be determined but also the amount of collateral circulation present can be ascertained.

(*b*) In saddle thrombus of the aorta.

(*c*) In the study of the site and extent of aneurysms, thromboses, and other vascular lesions in the aorta, common iliacs, femorals, renal, splenic, mesenteric, and other abdominal vessels.

(*d*) To differentiate vascular lesions from other intra-abdominal masses and calcifications.

3. In the Study of Abdominal Tumors: Selective study of the circulation, as demonstrated by abdominal arteriography, may aid in localization and identification of abdominal tumors. Thus, a pheochromocytoma suspected clinically may be localized and confirmed by an abdominal arteriogram. The abnormalities in the origin, distribution, and pattern of the blood supply to a mass lesion may be significant enough to be of aid in recognizing various pathological conditions.

4. To Determine the Position of the Placenta in the Uterus: Such study would be of aid in certain cases of placenta praevia (9).

CLINICAL APPLICATIONS

The clinical applications of abdominal arteriography may best be discussed by the presentation of representative cases from our series.

1. Renal Agenesis

A 40-year-old male veteran claimed injury to his left side during the war and understood that he now had a non-functioning left kidney. He gave a history of aching and pain in the right loin for the past one and a half years. The cystoscopist could not find a ureteral orifice on the left side, but could not be certain that one was not present. An intravenous pyelogram (Fig. 9A) revealed no evidence of a left renal shadow, nor was there any excretion of the contrast material on the left side. On the right side there was a double renal pelvis, with moderate caliectasis and pelviectasis. An abdominal arteriogram was obtained (Fig. 9B) in

order to determine whether or not a left kidney was present. It showed good filling of the aorta and especially of the inferior mesenteric artery and its branches. Two renal arteries were seen on the right, but none on the left. This study finally proved congenital absence of the left kidney.

2. Renal Atrophy

A 49-year-old colored male complained of pain in the lumbar region for several years. His blood Kahn reaction was negative. Roentgenograms of the lumbar spine were essentially non-contributory. An intravenous pyelogram showed a normal right side, but failure of visualization of the left kidney. A retrograde pyelogram (Fig. 10A) revealed the right kidney to be somewhat larger than normal, but no other definite abnormalities. On the left side the pelvis and calyces appeared smaller than normal.

The etiology of these findings was still not clear, and accordingly an abdominal arteriogram was obtained (Fig. 10B). This showed a saccular aneurysm of the proximal abdominal aorta. The right renal artery was well outlined and showed no abnormalities. The left renal artery was not visualized, but the splenic artery could be identified in the left upper quadrant. We believe that development of the aneurysm of the aorta prevented filling of the left renal artery, with subsequent atrophy of the left kidney.

3. Ectopic Kidney

A 24-year-old male had hematuria and left lower abdominal pain. A retrograde pyelogram showed a normal right kidney and an ectopic left kidney, with pelviectasis seen at the level of the first sacral segment, to the left of the midline. Abdominal arteriography, combined with retrograde pyelography (Fig. 11), was done in order to study the source of the blood supply to this ectopic kidney and to determine the length of the renal pedicle. The right renal artery was well visualized, but no definite vessel of any significant size was seen leading to the ectopic kidney. These findings were confirmed at operation.

4. Horseshoe Kidney

A 31-year-old male gave a history of right renal colic and hematuria. An intravenous pyelogram revealed a horseshoe kidney, with hydronephrosis and poor function of the right portion. The left portion showed no abnormalities. In order to accomplish a complete work-up in this case, abdominal arteriography was undertaken (Fig. 12). This showed a nephrogram of a horseshoe kidney, with two renal arteries supplying each half of the kidney. The right half was supplied by an upper renal artery, directly from the aorta, and by a lower renal artery which arose from a common trunk from the aorta. This common trunk also gave off two additional renal arteries that supplied the left half of the kidney. Another anomalous finding was that the right spermatic artery originated from the upper right renal artery. This study furnished complete information on the arterial supply to the kidney and was of considerable aid in planning a precise operation (partial nephrectomy with removal of the right portion).

5. Aberrant Renal Vessels

A 56-year-old male complained of chronic cough and weight loss. A chest roentgenogram showed a mass lesion. In order to rule out a lung tumor metastatic from the kidney, an intravenous pyelogram was obtained (Fig. 13A). This showed a normally functioning kidney on the right; on the left there was moderate pelviectasis. Better to evaluate this latter finding, abdominal arteriography was done (Fig. 13B). This gave bilateral nephrograms; no mass lesions were seen in either kidney. There were two renal arteries on the right. On the left only the lower renal artery was visualized, supplying the lower half of this kidney. There were, however, well visualized branches to the upper half of the kidney; hence, it was presumed that there was a second renal artery on the left side. We believe that the lower renal artery on the left probably caused the pelvic dilatation on that side.

6. Differentiation of Renal Tumors

Determination of the probable type of renal tumor is of more than academic interest, even though most of these are probably surgical lesions. If the nature of the tumor is known beforehand, better surgical planning will result. Thus, for renal-cell carcinomas, which spread predominantly by venous invasion, the operation should be planned so that the renal vein, and, if necessary, part of the inferior vena cava, can be removed with minimal trauma to these vessels, in order to avoid embolic spread.

If the lesion can be predicted as being a papillary carcinoma arising in the kidney pelvis, then the operation should be planned to permit removal of the ureter, because of the tendency of these tumors to produce satellite implants in the urinary tract.

Furthermore, in the difficult problem of hematuria with normal pyelograms, abdominal arteriography may permit visualization of a small cortical tumor.

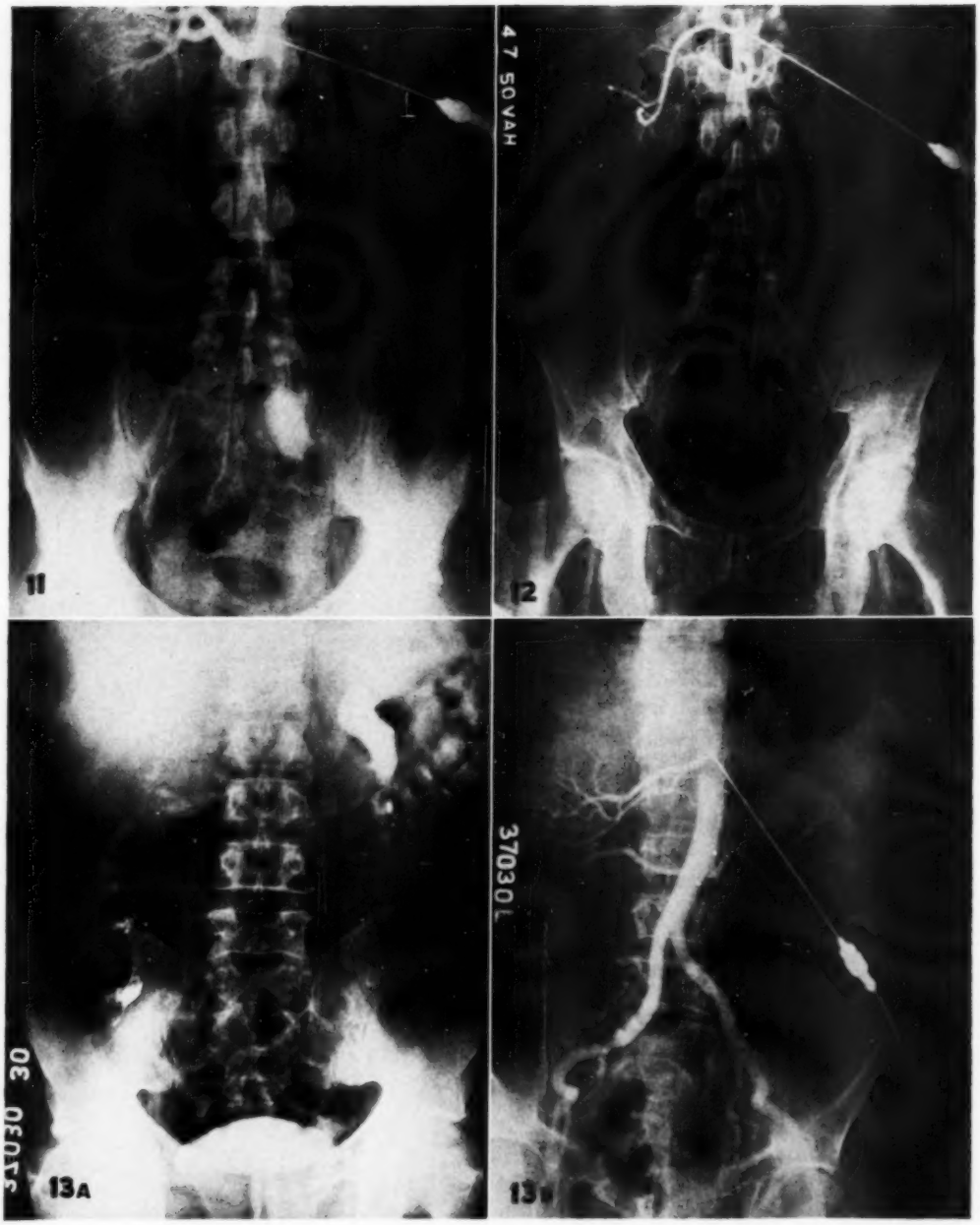

Fig. 11. Arteriogram combined with retrograde pyelogram, showing an ectopic left kidney. No definite renal vessels are visualized leading to this ectopic kidney. The right side appears normal.

Fig. 12. Arteriogram showing a nephrogram of a horseshoe kidney, and outlining its arterial supply. Note the right spermatic artery, originating from the upper right renal artery.

Fig. 13. A. Intravenous pyelogram showing a normally functioning kidney on the right; on the left there is moderate pelviectasis. B. Arteriogram on the same patient, showing two renal arteries on the right. On the left side, only the parenchymal branches of the upper renal artery are visualized, but the left lower renal artery is completely outlined. The left lower renal artery is most probably the cause of the pelvic dilatation of the left kidney.

Fig. 14. A. Retrograde pyelogram showing compression and displacement of the calyces of the lower pole of the right kidney. B. Arteriogram of the same patient, showing absence of blood vessels in the lower pole region (arrow), with displacement of vessels to the periphery of the mass lesion.

Fig. 15. A. Retrograde pyelogram showing a smooth, sharply outlined enlargement of the lower pole of the left kidney. Note the calcific streak at the periphery of the mass, medially. The inferior minor calyces show distortion and compression. B. Arteriogram showing an absence of blood vessels in the region of the large round mass, with displacement of vessels toward the upper pole of the left kidney.

(*a*) *Renal Cysts:* A 52-year-old white male gave a history of gross hematuria of seven days duration. A retrograde pyelogram (Fig. 14A) revealed compression and displacement of the calyces and infundibula by a mass in the lower half of the right kidney. In order better to evaluate these findings, an abdominal arteriogram was obtained (Fig. 14B). This showed absence of blood vessels in the region of the mass, with displacement of vessels to the periphery of the tumor. These findings were considered typical of a renal cyst, which was confirmed by a right nephrectomy.

Another patient, a 69-year-old male, had symptoms consistent with an enlarged prostate. An intravenous pyelogram revealed a mass in the lower pole of the left kidney. A retrograde pyelogram (Fig. 15A) showed a smooth, sharply outlined, enlargement of the lower pole of the left kidney; there was a small curvilinear calcific streak at the periphery of the mass, medially. The inferior minor calyces were distorted and compressed but showed no irregularity nor evidence of invasion. An abdominal arteriogram (Fig. 15B) revealed absence of blood vessels in the region of the large round mass of the left kidney, and a displacement of vessels toward the upper half of the kidney. We interpreted these findings as typical of a renal cyst.

(*b*) *Renal-Cell Carcinoma:* A 53-year-old male gave a history of painless gross hematuria. A retrograde pyelogram (Fig. 16A) revealed an enlarged right kidney, with distortion and incomplete filling of the calyces of the lower half of the kidney. An abdominal arteriogram, combined with a retrograde pyelogram (Fig. 16B), revealed staining, puddling, and laking of contrast material within the mass in the lower pole of the kidney. These findings were typical of a renal-cell carcinoma, which was confirmed by operation.

That a renal-cell carcinoma shows the very characteristic features of staining, puddling, and laking of the contrast material is not surprising when one considers that the nature of the tumor is such that it is extremely vascular, with many sinusoids, and almost always shows multiple areas of necrosis.

(*c*) *Papillary-Cell Carcinoma of the Renal Pelvis:* A 65-year-old male complained of hematuria, weakness, and weight loss. A retrograde pyelogram (Fig. 17A) revealed marked enlargement of the left renal shadow, with distortion and compression of the calyces and a coarsely irregular filling defect of the kidney pelvis, which suggested invasion. An abdominal arteriogram (Fig. 17B) showed a large avascular lesion of the left kidney, with displacement and compression of the renal vessels upward and medially. There was no staining, puddling, or laking within the mass, which ruled out a renal-cell carcinoma. It was thought that the tumor originated in the kidney pelvis and invaded the kidney parenchyma; this was confirmed at operation.

On the basis of the abdominal arteriogram only, the findings in this case of an avascular tumor with vessel displacement might be considered not unlike those of a renal cyst. However, the study of the abdominal arteriogram correlated with the retrograde pyelogram allowed a correct differentiation.

(*d*) *Fibroma of the Kidney:* A 55-year-old male had no complaints until the date of his admission to the hospital, when he suddenly fainted. Examination at that time revealed a tumor on the left side of the abdomen. A retrograde pyelogram (Fig. 18A) revealed a large round mass involving the lower two-thirds of the left kidney, with compression and displacement of the calyces, pelvis, and ureter. An abdominal arteriogram (Fig. 18B) was not entirely satisfactory, but fortunately the left renal artery was filled with contrast material. The mass was avascular and the renal vessels were displaced and compressed upward and laterally. The segment of the kidney which still functioned showed the nephrogram effect. These findings ruled out a renal-cell or papillary-cell carcinoma of this kidney. It was believed that a large cystic or solid tumor was most likely. A left nephrectomy was done, and the histopathologic findings were those of a very cellular fibroma of the kidney.

7. *Chronic Thrombotic Obliteration of the Aortic Bifurcation (Leriche Syndrome)*

The clinical findings, diagnosis, and treatment of the so-called Leriche syndrome have been discussed in recent reports (10, 12). The radiologist, by means of abdominal arteriography, can offer information as to (*a*) the site of the lesion, (*b*) its extent, and (*c*) the amount of collateral circulation present

A 42-year-old white male gave a history and findings typical of the Leriche syndrome. An abdominal arteriogram (Fig. 19) revealed good filling of the abdominal aorta. No contrast material entered the left common iliac artery or its branches. In the region of the bifurcation there was slight encroachment on the opaque column from the left side. A ribbon-like shadow of contrast density was seen running along the wall of the right common iliac and external iliac arteries. The lumbar arteries on the right were somewhat larger in caliber than usual, probably a manifestation of collateral circulation. These findings were believed to be typical of chronic thrombotic occlusion of the aortic bifurcation with extension into the iliac branches. This impression was confirmed postmortem.

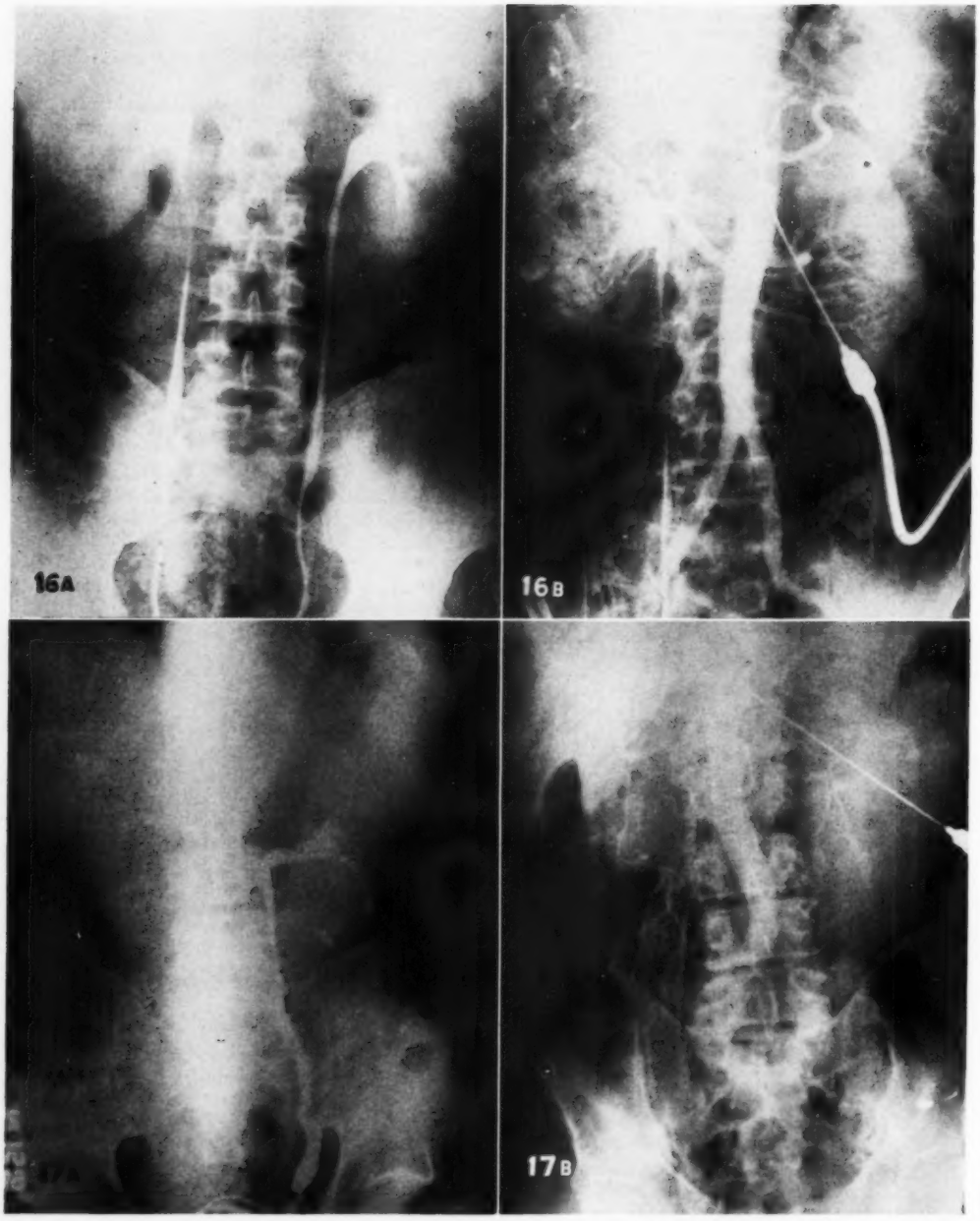

Fig. 16. A. Retrograde pyelogram showing an enlarged right kidney, with distortion and incomplete filling of the calyces of the lower half of this kidney. B. Arteriogram combined with a retrograde pyelogram, showing staining, puddling, and laking of contrast material in the tumor mass. These findings are very characteristic of renal-cell carcinoma.

Fig. 17. A. Retrograde pyelogram showing enlargement of the left renal shadow, with distortion and compression of the calyces and a coarsely irregular filling defect of the kidney pelvis. B. Arteriogram showing the large lesion of the left kidney to be avascular, with displacement and compression of the renal vessels upward and medially. Note the lack of staining, puddling, or laking within the tumor.

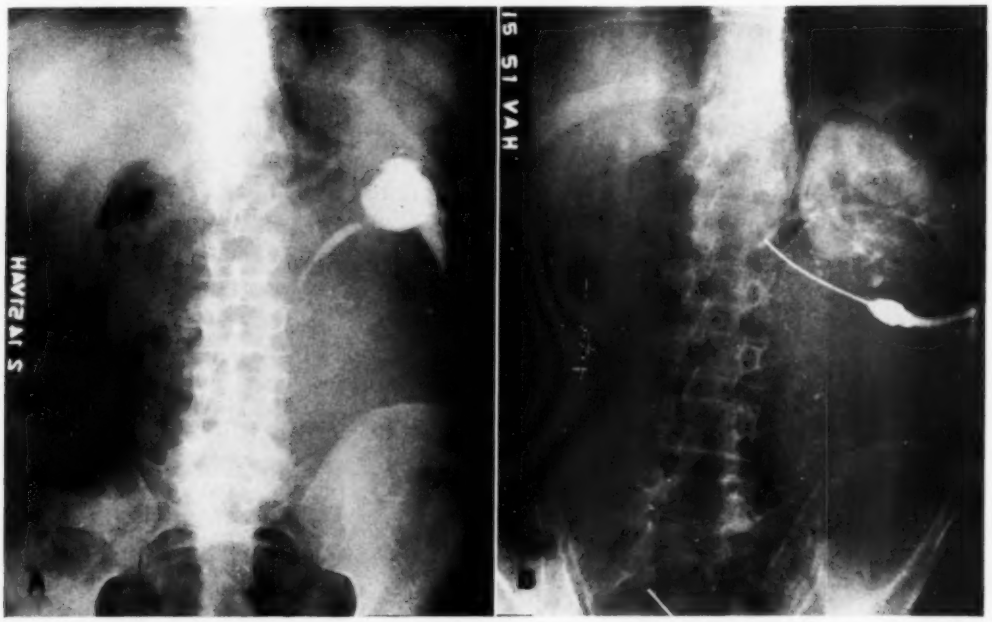

Fig. 18. A. Retrograde pyelogram showing a large round mass involving the lower two-thirds of the left kidney, with compression and displacement of the calyces, pelvis, and ureter.

B. Arteriogram is not entirely satisfactory but fortunately the left renal artery was filled with contrast material. The large mass is avascular, and the renal vessels are displaced upward and laterally. The segment of the kidney which still functions shows the nephrogram effect. (There are several small circular areas of opacification, in the left kidney region, which are artifacts, due to a little of the contrast material having been spilled on the skin of the back.)

8. Saddle Thrombus of the Aorta

A 49-year-old female gave a history of sudden onset of coldness, numbness, and paralysis of the right lower extremity. There was already a delay of four days when she was first seen. A diagnosis of saddle thrombus of the aorta, complicating rheumatic heart disease with auricular fibrillation, was entertained. Because of the long duration of the occlusion, it was decided to do an abdominal arteriogram before embolectomy was attempted. This arteriogram (Fig. 20) revealed very little contrast material in the aorta. The visceral arteries were unusually well filled out, probably because of the occlusion of the distal aorta. There were bilateral nephrograms. At operation a large thrombus, which extended about 4 cm. above the aortic bifurcation, was found.

9. Aneurysm of the Abdominal Aorta

A 49-year-old male complained of mid-abdominal pain of about six weeks duration, becoming progressively more severe. The blood Kahn reaction was negative. As a further study of the smooth mass felt in the umbilical region, as well as the rest of the aorta, abdominal arteriography (Fig. 21) was done. The aorta filled out well with contrast material to the level of the third lumbar vertebral body. Below this level the contrast material did not fill out the fusiform aneurysm of the aorta, which showed calcific plaques in its walls.

We feel that this case would have been more adequately studied if another film had been exposed one to two seconds after completion of the first arteriogram. In this interval of time, the stream of contrast material, which was probably temporarily delayed by eddy formation within the aneurysm, would have progressed to the distal aorta and the iliac arteries. The second exposure would probably have shown that there was still circulation in the aorta distal to the aneurysm.

10. Aneurysm of the Common Iliac Artery

A 75-year-old male, who complained of low abdominal pain, had a palpable non-pulsating mass in the left lower quadrant. An abdominal arteriogram (Fig. 22) revealed good filling of the aorta and of the right iliac vessels, which were somewhat tortuous. On the left, about 5 cm. distal to the aortic bifurcation, only a small amount of contrast material was seen to enter the aneurysmal

Fig. 19. Abdominal arteriogram showing failure of contrast material to enter the left common iliac artery. There is a ribbon-like shadow of contrast density running along the wall of the right common iliac and external iliac arteries. Note the enlarged lumbar arteries on the right. These findings are typical of a chronic thrombotic obliteration of the aortic bifurcation.

Fig. 20. Abdominal arteriogram showing very little contrast material in the aorta. The visceral arteries are well filled out because of the embolic occlusion of the distal aorta. There are bilateral nephrograms.

Fig. 21. Abdominal arteriogram showing the aorta to be well filled out with contrast material, down to the level of the third lumbar vertebral body. Below this level the contrast material does not fill out the fusiform aneurysm of the aorta, which shows calcific plaques in its walls (arrows).

Fig. 22. Abdominal arteriogram showing aorta and right common iliac vessels to be somewhat tortuous. On the left, about 5 cm. distal to the aortic bifurcation, only a small amount of contrast material enters the aneurysmal dilatation of the left common iliac artery. Calcifications in the walls of this aneurysm are sharply outlined.

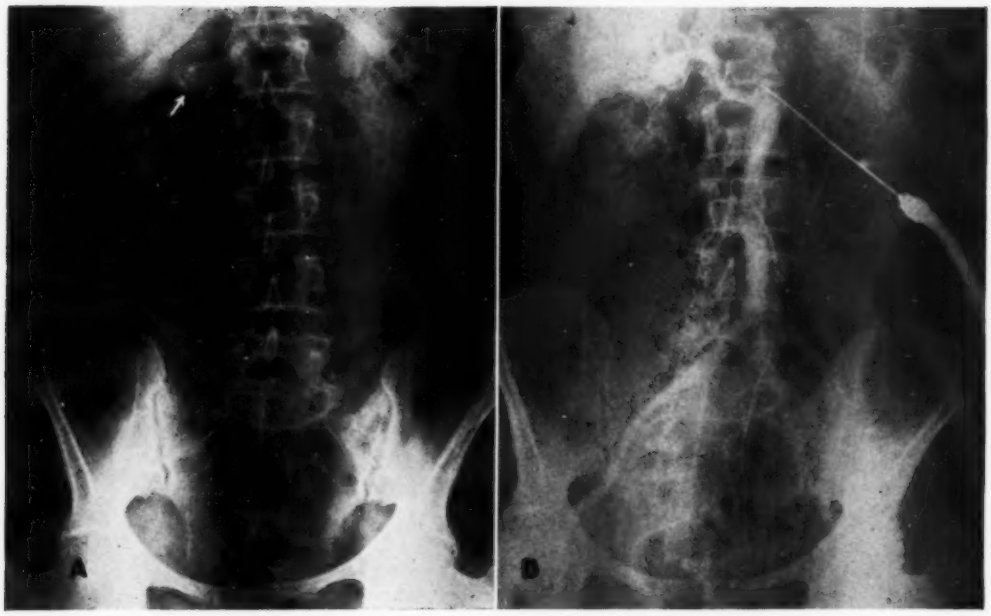

Fig. 23. A. Scout film of the abdomen, revealing a sharply outlined ring-like radiodensity (arrow).
B. Abdominal arteriogram showing a saccular aneurysm of the right renal artery, almost completely filled out with contrast material. The calcifications in its walls are still visualized.

dilatation of the left common iliac artery. Calcification in the walls of this aneurysm was sharply outlined. The localization and extent of the lesion could thus be delineated precisely.

11. Aneurysm of the Renal Artery

A 65-year-old female gave a history of episodes of colicky pain in the right upper abdomen for many years. A cholecystectomy had been performed fifteen years previously. A scout film of the abdomen (Fig. 23A) revealed a sharply outlined ring-like radiodensity, measuring 2.5 cm. in diameter, at the level of the right transverse process of the first lumbar vertebral body. An abdominal arteriogram (Fig. 23B) showed a saccular aneurysm of the right renal artery almost completely filled out with contrast material, and with calcification in its wall. These findings were confirmed at operation.

12. Calcification in Wall of Renal Vein

A 60-year-old female still continued to have right upper quadrant pain and discomfort after a cholecystectomy. A retrograde pyelogram (Fig. 24A) revealed a sharply outlined circular radiodensity at the upper pole of the hilus of the right kidney. There were no other abnormalities. In order to study further this unusual radiodensity, an abdominal arteriogram (Fig. 24B) was obtained. This revealed the calcific density to be just below the right renal artery. These findings were suggestive of calcification of the right renal vein, and were confirmed at operation.

13. Study of Abdominal Tumors: Pheochromocytoma

A 40-year-old female was admitted to the hospital with known hypertension for about two years, during which time she complained also of intermittent generalized headaches. Because of a palpable left abdominal mass, a retrograde pyelogram (Fig. 25A) was obtained. This revealed the lower pole of the left kidney and the proximal third of the left ureter to be displaced laterally by an ill-defined soft-tissue mass, within which were several small areas of calcific mottling. An abdominal arteriogram (Fig. 25B) showed the lesion to have a very vascular tumor bed, which was well outlined by the contrast material. There were no large vessels leading to this mass. A tentative diagnosis of a highly vascular extrarenal retroperitoneal tumor was made. Histopathologic study showed a benign pheochromocytoma.

SUMMARY

1. A brief historical background of the procedure of abdominal arteriography has been presented.

2. The technic of the procedure and

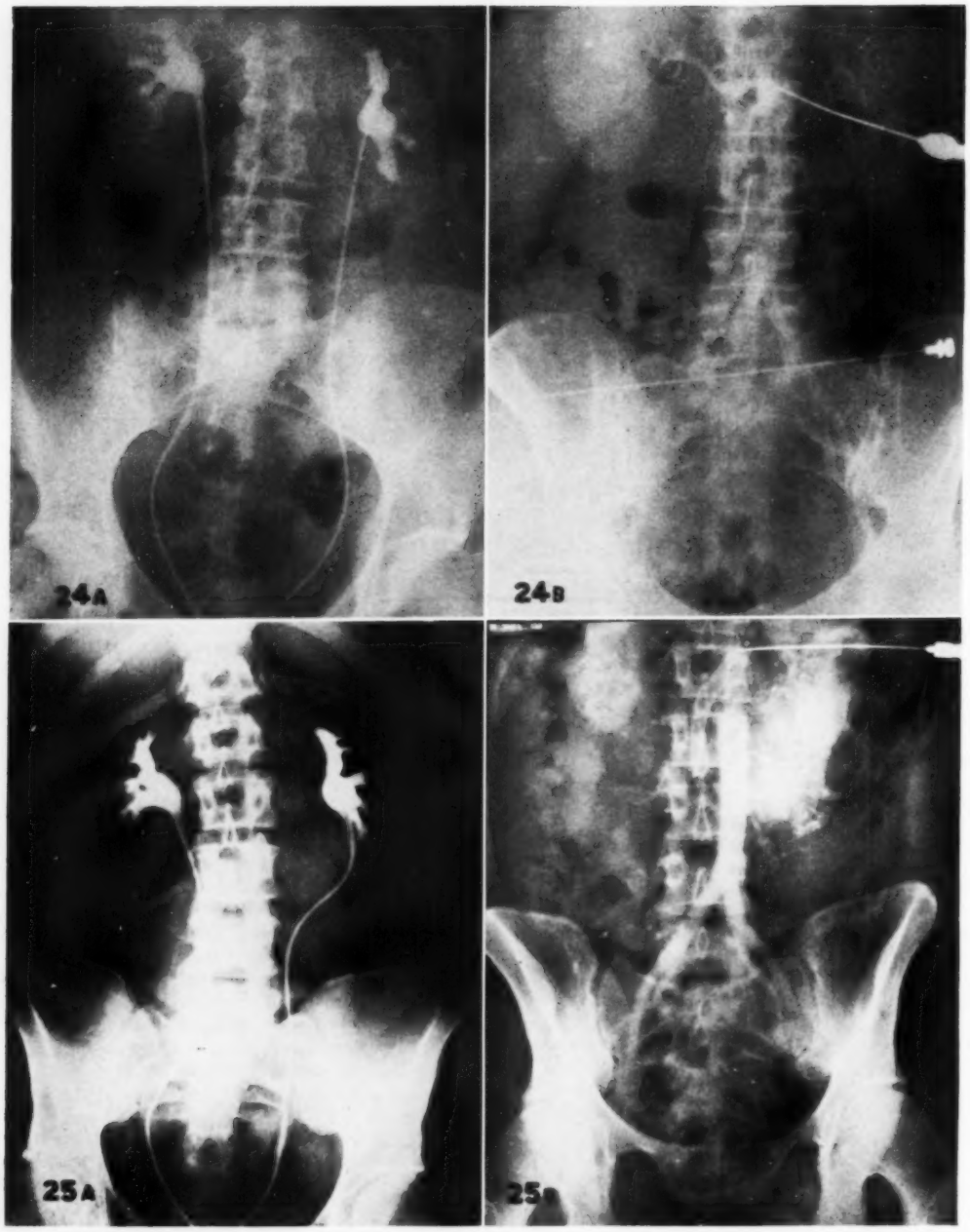

Fig. 24. A. Retrograde pyelogram showing a sharply outlined circular radiodensity at the upper pole of the hilus of the right kidney. B. Arteriogram on the same patient shows the ring-like radiodensity to be just outside of and below the right renal artery.

Fig. 25. A. Retrograde pyelogram showing the lower pole of the left kidney and the proximal third of the left ureter to be displaced laterally by an ill-defined soft-tissue mass. Several small areas of calcific mottling are seen within this mass.

B. Abdominal arteriogram on the same patient, showing a very vascular tumor bed. Note the tumor staining and the lack of demonstrable vessels leading to this mass.

the after-care of the patient have been outlined. Previous intravenous pyelography is recommended as a test for iodide sensitivity.

3. Illustrations have been presented, demonstrating the normal roentgen anatomy of the abdominal aorta and its branches.

4. Some complications of the procedure and their management have been discussed.

5. Indications for abdominal arteriography have been listed.

6. Clinical applications of the procedure have been discussed and illustrated by the presentation of pertinent findings in 17 patients.

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SUMARIO

La Arteriografía Abdominal: Repaso, con Análisis de Diecisiete Casos

La arteriografía abdominal está indicada para el descubrimiento de anormalidades del patrón vascular del parénquima renal en varias enfermedades y anomalías del riñón y para el estudio de las afecciones de la aorta abdominal y de las ramas de la misma. Puede también ayudar, por su estudio selectivo de la circulación, en la localización y la identificación de los tumores abdominales y puede resultar útil en ciertos casos de placenta previa.

Descríbese sucintamente la técnica. Recomiéndase que, como sistema, se obtenga antes una pielografía intravenosa que servirá para comprobar la sensibilidad al yoduro. Además del yodismo agudo, posibles complicaciones son la extravasación del medio de contraste, lo cual no ha provocado efectos graves en la serie del A.; hematoma consecutivo a la punción aórtica, lo cual no ha sido observado en el hombre; inyección directa del medio en las ramas mayores de la aorta abdominal o en la cava inferior; difusión de una trombosis arterial.

Diecisiete breves historias clínicas con grabados muestran las aplicaciones clínicas del procedimiento en estos estados: agenesia renal y atrofía renal; riñón ectópico y en herradura; vasos renales aberrantes; diferenciación de tumores renales; obliteración trombótica crónica de la bifurcación de la aorta (síndrome de Leriche); trombo en silla de montar de la aorta; aneurisma de la aorta abdominal, la arteria ilíaca primitiva y la arteria renal; calcificación de la pared de la vena renal; feocromocitoma.

Full-Column Technic in Lumbar Disk Myelography[1]

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THERE EXIST considerable differences of opinion as to the role of myelography in the diagnosis and treatment of herniated disks (3, 4, 7). It seems likely that such differences arise from the variety of technics employed, with consequent variations in accuracy. This paper presents a method which is believed to be highly accurate and rarely misleading.

It has been customary in Pantopaque myelography to use small quantities of oil, ordinarily 3 c.c. (1), a practice derived from the older Lipiodol technic (6). Lipiodol is absorbed extremely slowly and, because of its great viscosity, is difficult or impossible to remove by aspiration. The necessity of using minimal quantities of such an agent is clear. Myelography with Lipiodol was usually restricted to cases where a block of spinal fluid pathways was demonstrated by the Queckenstedt test, largely to determine the level of the block prior to surgery (2). Odin, Rünstrom, and Lindblom, in 1928, were the first to recognize the importance of using larger amounts of contrast medium (5–10 c.c.) in order to visualize adequately the defects due to intramedullary, intradural, and extradural lesions.

Pantopaque, a lighter and less viscous substance, is reasonably easy to aspirate from the theca, is relatively non-irritating, and, if left within the spinal canal, is absorbed considerably more rapidly than Lipiodol (7). These factors permit utilization of Pantopaque myelography for evaluation of situations in which a Lipiodol study would appear unwarranted. In addition, the quantity of Pantopaque may be increased as determined by the needs of a suitable technic, rather than being limited by fear of serious sequelae. The cause of the difficulty when only 3 c.c. of Pantopaque are employed is easy to demonstrate (5).

Figure 1 is a diagrammatic sketch of a view seldom seen during myelography. The patient is in the prone position, and a lateral view is taken with a horizontal beam, *i.e.*, across the table. A thin film of oil may be seen extending from the middle

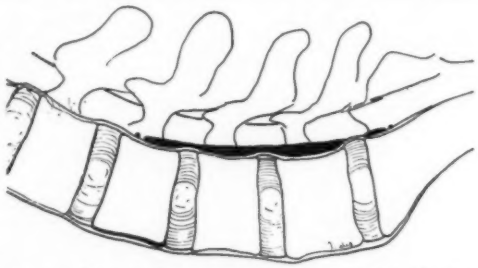

Fig. 1. Diagram of prone lateral view obtained with only 3 c.c. of Pantopaque.

of L3 down to the sacrum. The oil is deeper at the concave surfaces of the vertebral bodies and thinner where it covers the annulus fibrosus over the convexity of the intervertebral disk. In this figure, the oil column, following the course dictated by gravity and its viscosity, has broken at the L5-S1 interspace, leaving a gap, with a bit of oil at the sacrum. Such a situation is perfectly normal and is the result of normal anatomical and physical factors.

Figure 2 shows diagrammatically the appearance of the same oil column, in the same position as in Figure 1, but in a prone anteroposterior (or postero-anterior) view. The oil column breaks at least partly at each level; it crosses the middle of the annulus at L3-4, covers the entire right side at L4-5, and is completely absent at L5-S1. It might be possible to get some degree of covering of each of the annuli with oil by judicious tilting and retilting. On the other hand, even with the greatest care, ap-

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parent defects such as these may remain. These "false defects" are probably largely responsible for the rather considerable inaccuracy reported for some lumbar disk studies. At any rate, they may so occupy the attention and time of the examiner that the actual site of the lesion may be incompletely examined.

In addition, as shown in Figure 3, with this "thin-film" technic only the ventral portion of the thecal sac may be filled with the patient prone. Nerve root pouches may lie posterolateral to the oil level and deformities of these pouches may well be missed completely. More complete filling, as in Figure 4, would reach this area.

The oblique myelogram has theoretical advantages (1) and, as we shall later demonstrate, these become real when the full-column technic to be described here is used. Without complete filling of the subarachnoid space, the oblique view loses much of its usefulness. When the prone patient is tilted so that his left side is elevated (left posterior oblique view), as in Figure 5, the left foraminal area and left lateral aspect of the annular region are not reached by the oil, so that a profile view of a lesion is not obtained. The right foraminal area and right lateral aspect of the annular region are completely submerged beneath the opaque material, so that an *en face* view of a lesion might also be unobtainable.

In Figure 6 are shown three anteroposterior views of a prone patient in whom 3 c.c. of Pantopaque is being manipulated at the L4-5 interspace. An apparent defect in the first view becomes smaller in the second and disappears in the third picture. This is a typical "false defect" and does not represent a pathological process. The lack of reproducibility of findings under such critical conditions is obvious.

In myelography with 3 c.c., one attempts a sort of *en face* visualization of the lesion, pushing up through an oil film. Obviously, however, it is not possible to apply graded compression to the examined area to bring the defect out, and there is little exact control of the thickness of the oil by manipulation. The viscosity of an oily opaque medium in a region filled with an aqueous fluid introduces vagaries difficult to control or to recognize.

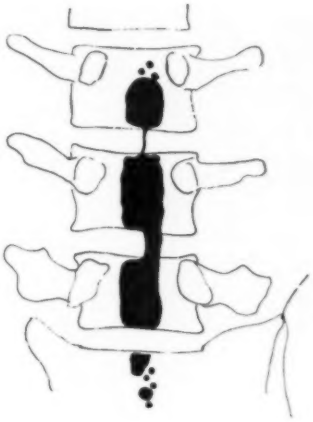
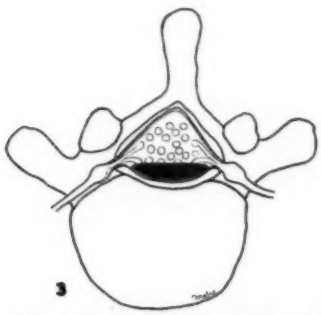


Fig. 2. Diagram of prone anteroposterior view, duplicating conditions of Fig. 1.



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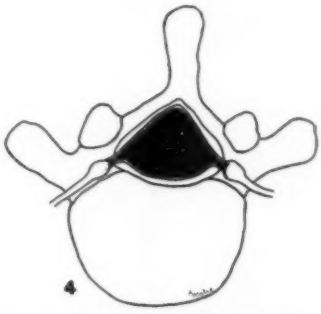

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Fig. 3. Diagram of cross section of prone patient, with 3 c.c. of Pantopaque.
Fig. 4. Diagram duplicating conditions of Fig. 3, but with subarachnoid canal completely filled with Pantopaque.

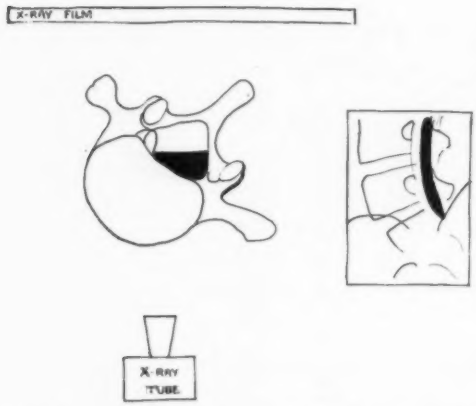

Fig. 5. Diagrammatic cross section of left posterior oblique position with 3 c.c. of Pantopaque and patient recumbent.

the cylinder is rotated on its long axis so that the defect impinges upon the projected outline of the cylinder, *i.e.*, comes into profile. This is in contrast to efforts at frontal or *en face* visualization of oil flowing around one or both sides of a defect.

Six cubic centimeters of Pantopaque is injected through the lumbar puncture needle. After it has been noted that the Pantopaque has the normal appearance and is presumably subarachnoid, the patient is brought into the erect position on the tilt table and the level of filling is observed. The patient may then be lowered and, if necessary, additional oil may be injected to reach the level of interest. Six cubic centimeters of Pantopaque will suffice to reach the level of the body of L4 in about half the cases; in the remainder, 9 or 12 c.c. will be required to reach this level (5). Since the great majority of protruded disks occur at L4-L5 and L5-S1, more than 12 c.c. is rarely necessary. However, as much as 24 c.c. has been injected without ill effect.

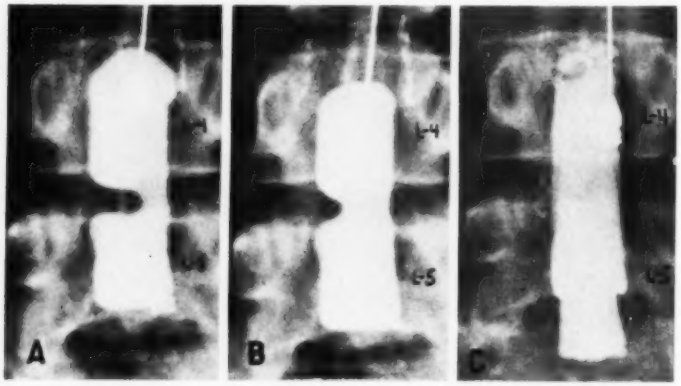

Fig. 6. The "false defect" in thin-film myelography.

FULL COLUMN TECHNIC

Because of the possibility of using larger amounts of Pantopaque, it seemed that a "full-column" method would be feasible and might overcome the uncertainty of thin-film technic. The full-column method is based wholly upon profile visualization. The principle of the method is to inject sufficient oil into the lumbar canal to reach and completely fill the region in question, with the patient in the erect position. By this means, the lumbar subarachnoid space is effectually converted into an opaque cylinder. Any deformity pressing into this cylinder may be clearly visualized and accurately measured, provided

With the patient erect, a fluid level is seen at the top of the column of oil, and spot films are taken. A fluid level on the film indicates at a glance that the patient is erect and that the canal below that level is as completely filled as possible. Anteroposterior, lateral, and 45° oblique spot films are taken routinely. If no lesion is observed, 30° and 60° oblique views are

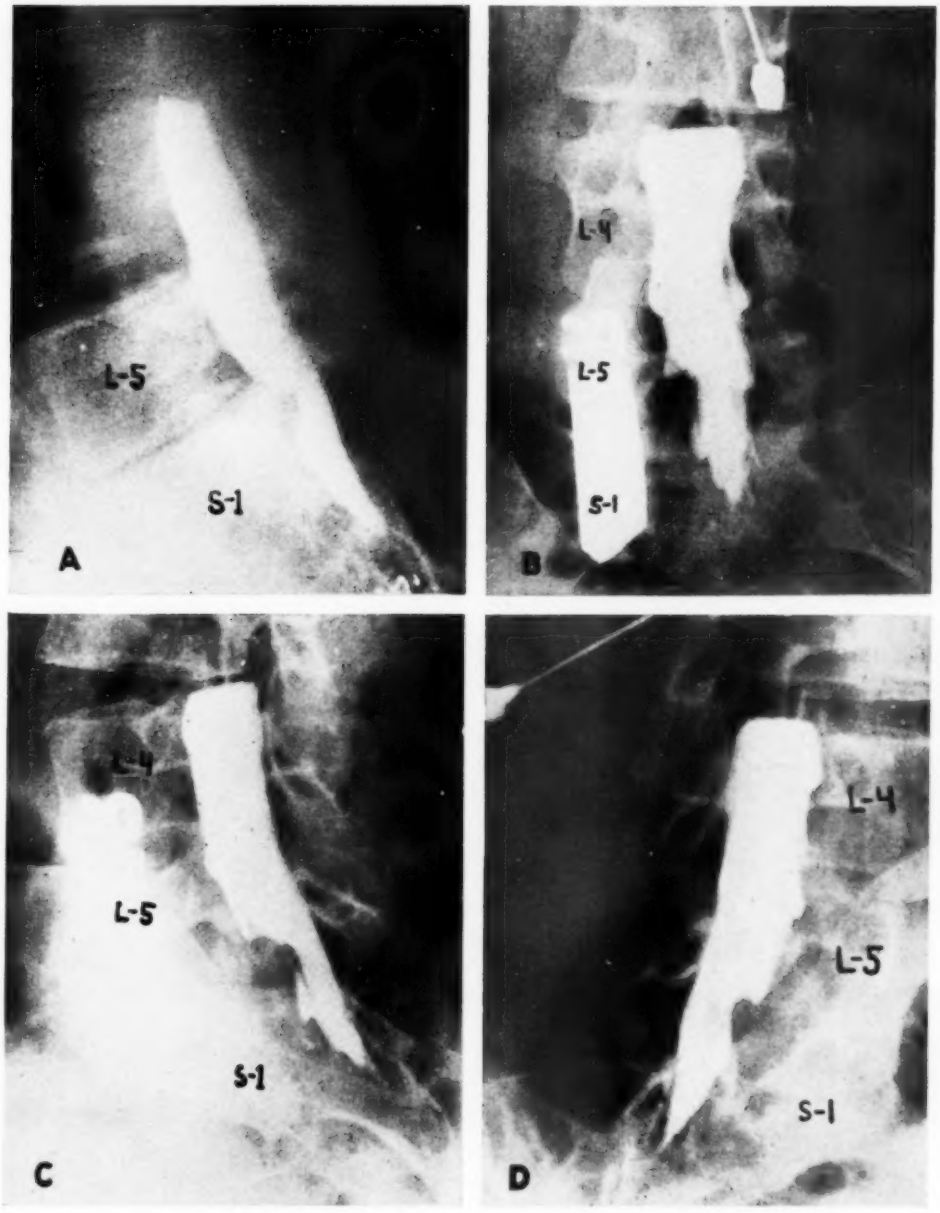

Fig. 7. Large right L5—S1 extruded disk.

added. If the defect is seen fluoroscopically, a spot film is taken at the optimum obliquity. The opposite oblique at the same angle is also recorded for purposes of comparison of the two sides. In contrast to experience with the thin-film technic, in which fluoroscopic study was the mainstay of diagnosis, in the full-column technic the films provide all the essential diagnostic information. The appearance in each projection is reproducible and constant. The films are readily interpretable by anyone

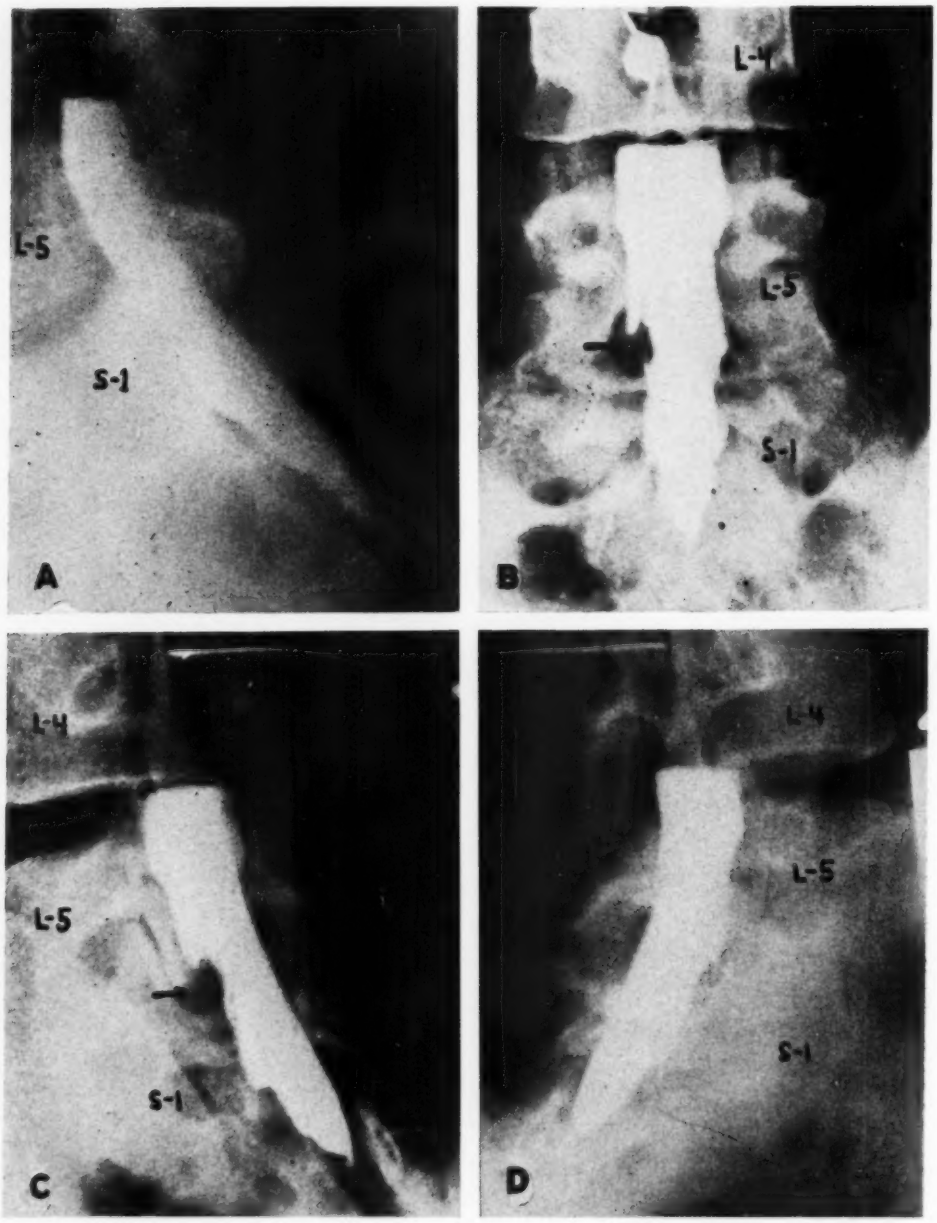

Fig. 8. Small extruded disk fragment surrounding the right S1 root.

familiar with the procedure without benefit of fluoroscopic findings. Fluoroscopy is minimized, being used mainly for positioning the patient for the films.

The objection may be raised that small defects may be masked by the use of large amounts of oil (1). This would be true if the defects in question were "intraluminal" in nature. Since they are peripheral, the analogy of the cylinder filled with opaque

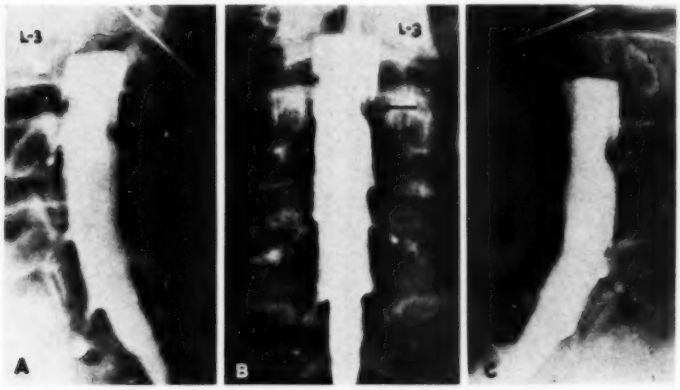

Fig. 9. Extruded fragment of disk at L3—L4 on the left.

medium indicates that even small lesions will be easily detected if the correct projection is obtained.

Any defect demonstrated in the full Pantopaque outline represents actual impingement. Since multiple projections of the same opaque column are obtained, it is possible to recognize not only the presence and level of the lesion, but to determine with accuracy whether the protrusion is medial or lateral, and to predict its size. An extruded bit of material with a torn annulus can usually be differentiated from simple bulging of a weakened annulus in which extrusion has not yet occurred. This is of considerable significance, since the demonstration of an extruded disk fragment is generally accepted as an indication for operative intervention.

A group of illustrative myelograms can best demonstrate how precise the information achieved by the full-column technic may be. It must be emphasized that no special skill or good fortune is required to obtain such films. In any doubtful case, it must be possible to duplicate the findings on retilting the patient into the erect position. The original set of films is developed immediately, before the oil is removed, in order to determine whether the procedure should be repeated.

Figure 7 shows a large right-sided extruded disk at L5-S1. The fragment extends beyond the mid-line to the left but does not reach the left root sheath. The

Fig. 10. Disparity in length of S1 root pouches.

lobulated irregularity, which indicates extrusion, is clearly seen on the lateral and anteroposterior views. The large defect in the right posterior oblique view is clear. The extension in front and to the left produces a marked defect on the lateral view as well as the smaller defect in the left posterior oblique projection. On the anteroposterior view, the preservation of the normal length of the left S1 root is in

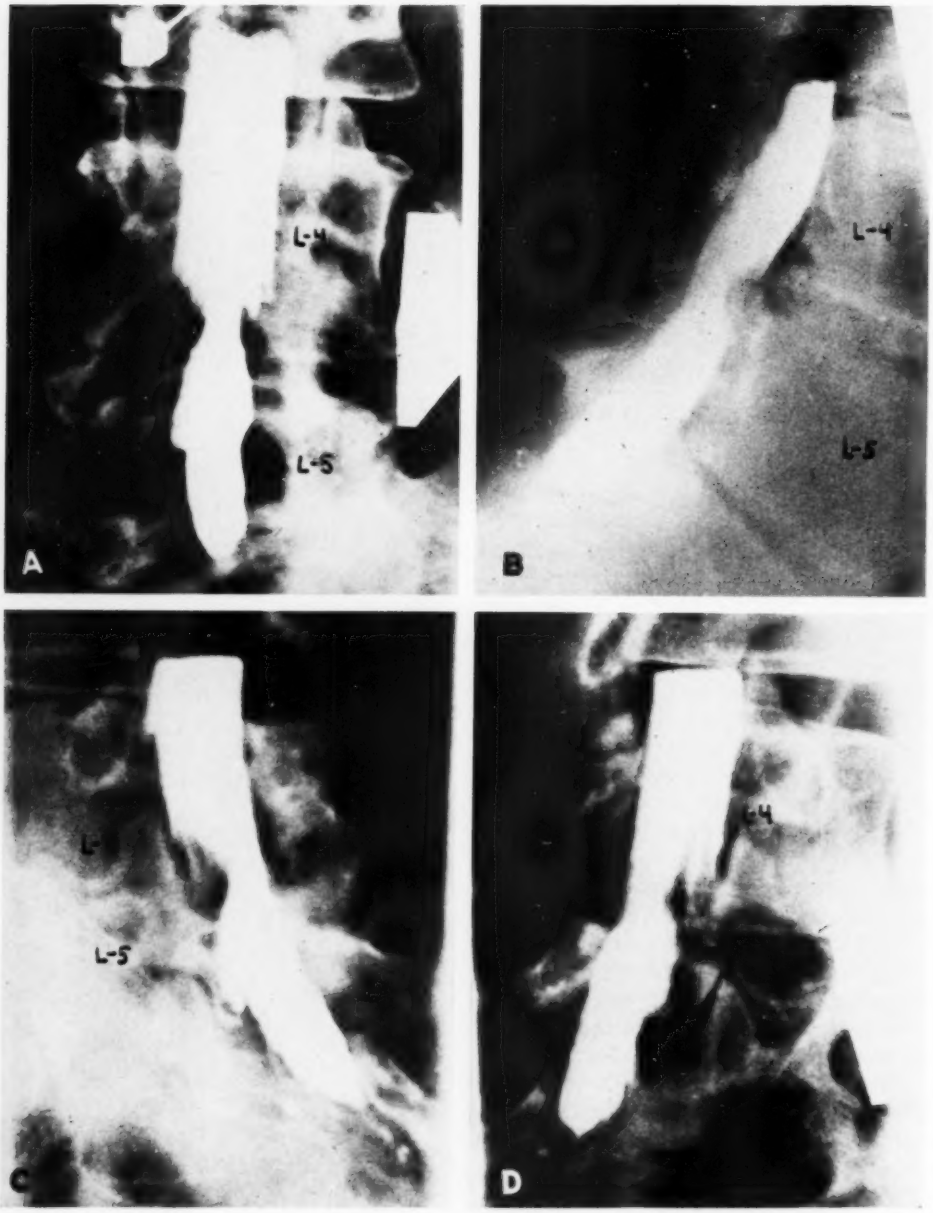

Fig. 11. Mid-line extruded disk at L4—L5, extending to both sides.

contrast to the cut-off appearance of the right S1 root. The fluid level, hallmark of the full column, is at the L3-4 interspace.

Figure 8 shows another L5-S1 disk defect; also an extruded fragment, though very small. This proved to be a bit of broken cartilage surrounding the right S1 root almost like a cuff. In contrast to the normal appearance of the lateral and the left posterior oblique views, the lesion is clearly demonstrated on the anteroposterior and right posterior oblique views (marked

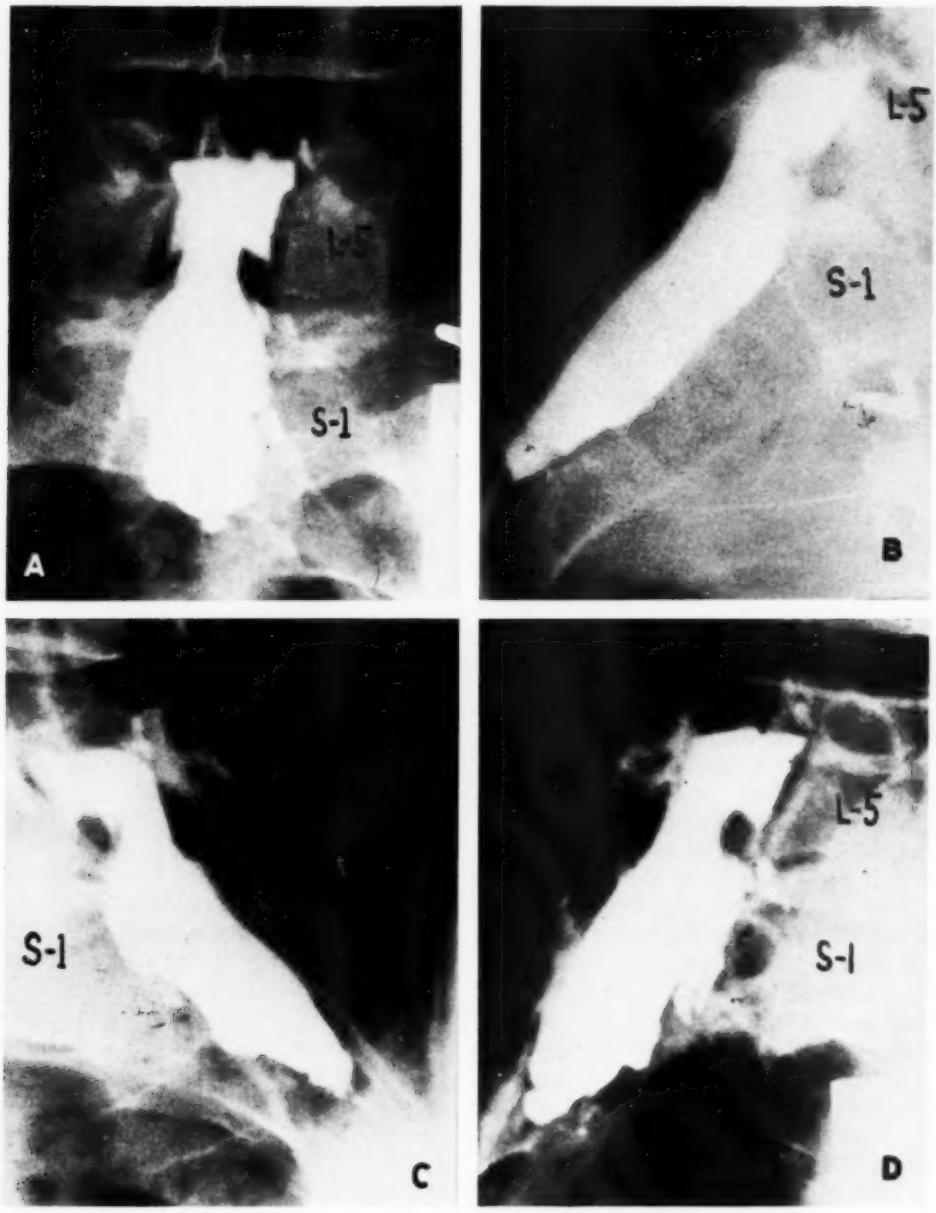

Fig. 12. Mid-line extruded disk at L4—L5, extending to both sides.

by arrows). The fluid level is at the L4-L5 interspace with 6 c.c. of Pantopaque.

In Figure 9, in the anteroposterior view, the column is shown with a small and rounded indentation on the left just at the lower border of the L3-L4 interspace (arrow). In the left posterior oblique view, the corresponding defect appears with posterior displacement and an angular cutting off of the L4 root (arrow). In the right posterior oblique film, a small rounded defect is brought into profile on the left

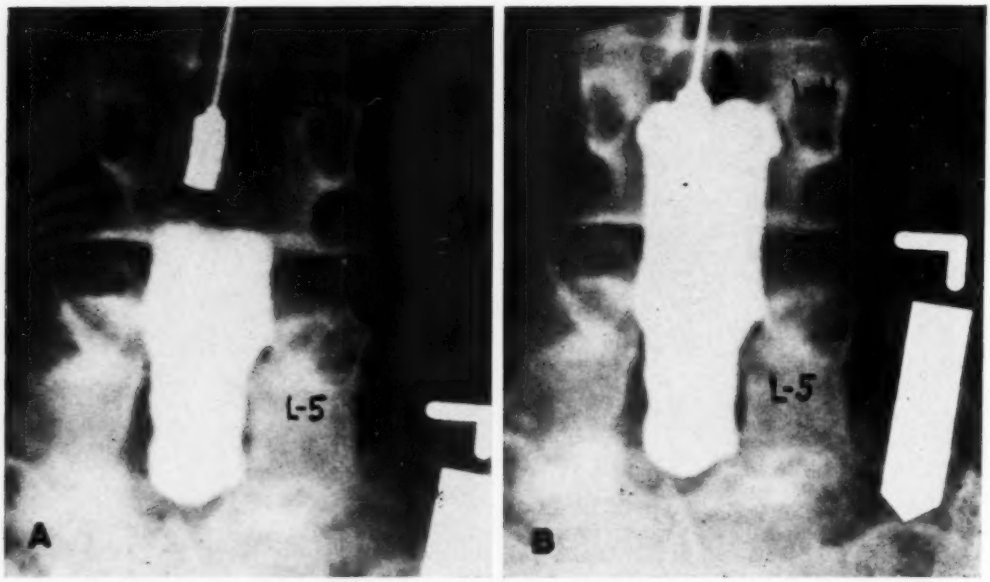

Fig. 13. Same case as Fig. 12: postoperative occlusion of subarachnoid space by scarring.

side, which represents posterior extension of the same lesion. The position of this defect just below the interspace indicates extrusion. The fluid level is at the body of L3 with 9 c.c. of Pantopaque.

Another finding is shown in Figure 10, where the left S1 root (arrow) is quite short, while the right S1 root is quite long. There is no deformity of the column, and the root is not cut off with a sharp border. These findings are not diagnostic of a pathological change. Nevertheless, a herniated disk on the left side is by no means excluded, since the width of the opaque column, which is 1.2 cm., is considerably less than the interpedicular distance, which is almost 4 cm. (1, 8). Because of this disproportion between the subarachnoid spinal canal and its bony walls, a protruded disk must be quite large to reach the opaque column. The root and root pouch, however, may be distorted by a protruded disk without impingement on the column.

A bilateral and mid-line herniated disk is shown in Figure 11. The serrated borders of the defects at L4-5 in all views indicate extrusion, as does the slightly downward extension of the defect in the lateral view (8). In this case, 6 c.c. of Pantopaque was sufficient to place the fluid level at the lower border of L3. It is worthy of note that, although the narrowed intervertebral space was at L5-S1, the herniation occurred at L4-5.

Figure 12 shows defects at L5-S1 which cut sharply into the column in both right and left oblique projections, with abrupt concave cuts into the S1 root pouches bilaterally. The extension forward on both sides is therefore demonstrated, while the lateral view indicates the extension directly across the midline. This was a large disk herniation, extending from one foramen all the way to the other. The large fragment was adherent to the ventral dura, and a transdural approach was required for its complete removal. The tremendous size of the caudal sac is worthy of note, the subarachnoid space extending far down the sacrum. Twelve cubic centimeters of Pantopaque were required to raise the fluid level to the upper border of L5 with the patient erect.

After difficult surgery, the occurrence of scarring may lead to chronic disability. In Figures 12 and 13 preoperative and postoperative myelograms of the same patient are reproduced. Preoperatively (Fig. 12) there was a very large cul-de-sac below S1. Two months postoperatively, with 6 c.c. of Pantopaque, no oil is demonstrated below L5-S1 interspace (Fig. 13A). That the patient is fully erect is shown by the fluid level at the lower border of L4. There is an irregular constriction extending downward from the upper border of L5. The reproducibility of this appearance is shown in a repeat myelogram done with 9 c.c. of Pantopaque (Fig. 13B).

CONCLUSIONS

In myelography, it is safe to use larger quantities of Pantopaque than Lipiodol. A full-column method for investigation of the lumbar subarachnoid space is therefore feasible. With this method, lumbar disk myelography can be done rapidly and accurately. Reproducible films, which correspond to anatomic and pathologic features, are easily achieved.

The results have proved so satisfactory that operative intervention for lumbar disk herniation is practically always preceded by myelography. The myelographic findings are helpful in deciding the type of operative approach as well as for confirmation of the site and extent of involvement. The operative indication may also be confirmed by the demonstration of extrusion.

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SUMARIO

La Tecnica del Cilindro Lleno en la Mielografía de los Discos Lumbares

Descríbese una técnica de "cilindro lleno" para la observación mielográfica de la porción lumbar de la columna vertebral. Permite hacer esto el uso de Pantopaco que, debido a su poca viscosidad, facilidad con que se aspira y falta de propiedades irritantes, puede usarse en cantidades más grandes que el Lipiodol y capacita para justipreciar situaciones en que no parecería justificado el empleo del último medio.

El principio del método es inyectar suficiente aceite en el conducto lumbar para alcanzar y llenar completamente la región mencionada, con el enfermo en la posición erguida. De este modo, se convierte efectivamente el espacio subaracnoideo lumbar en un cilindro opaco. Se visualizará así claramente y se medirá exactamente toda deformida que comprima ese cilindro, con tal que se rote éste sobre su eje largo, de modo que la deformación dé contra el contorno proyectante, es decir, que aparece de perfil. Esto es en contraposición a los esfuerzos encaminados a obtener visualización frontal o "de cara" del aceite que fluye alrededor de uno o de ambos lados de la deformidad.

Seis centímetros cúbicos de Pantopaco bastarán para alcanzar el nivel de L4 en el cuerpo aproximadamente en la mitad de los casos; y en el resto se necesitarán 9 ó

12 cc. Como la inmensa mayoría de los discos protruídos quedan en L4-L5 y L5-S1, rara vez se requieren más de 12 cc. No obstante, se han inyectado hasta 24 cc. sin efectos adversos.

En contraposición a lo observado con la técnica de película delgada, en la que el estudio roentgenoscópico es la base fundamental del diagnóstico, con la técnica del cilindro lleno, las radiografías facilitan toda la información indispensable para el diagnóstico. El aspecto en cada proyección es reproducible y constante.

Un grupo de mielogramas típicos muestra la precisión de la información obtenible con esta técnica. En la práctica de los AA., el procedimiento ha resultado tan útil que la intervención cruenta por hernia de los discos lumbares va prácticamente siempre precedida de la mielografía.

The Concurrence of Parietal Thinness with Postmenopausal, Senile, or Idiopathic Osteoporosis[1]

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ALTHOUGH THINNESS of the parietal bones has long been known in the anthropologic and pathologic literature, it has received relatively little attention from a roentgenologic point of view. In discussing the occurrence of this condition from antiquity to the present time, Wilson (7) mentioned that the case he described was the second to be reported in the United States, and the fifth in the world, with skull roentgenograms. The same year (1944) Camp and Nash (2) reported 119 cases indicating that this condition is not rare.

No clinical importance has been ascribed to parietal thinness. It usually involves the posterior parasagittal regions and assumes either a rectangular "flat" or a sulcus-like "grooved" configuration, the former being more frequent. Information as to the pathologic appearance of parietal thinness is available mainly in the work of the older pathologists and is presented in considerable detail by Greig (3) in his admirable review. Ziegler (8) stated that no sharp line of demarcation could be seen between the depressions and the adjacent normal skull tables. Virchow (6) believed that parietal thinness started as a localized disappearance of the superficial layers of the external skull table and gradually progressed through it, the diploe, and on occasion the inner table of the skull. Immediately beneath the absorbed region the bone tissue was described as becoming more stratified than usual, sclerosis following apposition of the lamellar bone spicules in the diploic spaces. Schmidt (5) was impressed by the lack of osteoclasts and concluded that the process responsible for parietal thinness was one of diminished bone formation rather than increased bone destruction. Kaufmann (4) noted the coexistence of marked atrophic changes in the remainder of the skeleton, particularly the vertebrae, with parietal and temporal bone atrophy and ascribed the process to senile or marantic changes.

The cause of parietal thinness has long been discussed, and no definite etiology has been determined. Virchow believed it to be associated with atrophy and senility. Greig proposed that a more universally applicable explanation was a dysplasia of the diploe, which, in these cases, had never developed in the parietal region, the latter remaining in the same state as the lower occipital bone, thin, semitransparent, and devoid of diploe. Greig discussed the various etiologic theories presented in the past, and excluded injury, inflammation, congenital causes, and senility as factors. The diploic dysplasia theory is accepted by Wilson and by Camp and Nash.

OBSERVATIONS

The present series of cases numbers 26. Parietal thinness was better identified as a rule on the frontal projections, but could be seen on lateral roentgenograms as well. It was often found advisable to vary the angles of projection in the frontal positions so as to bring the suspected areas tangential to the film. The Towne's and reversed Towne's views proved most suitable. The condition sometimes was undemonstrable on routine frontal views. The use of underexposed films to avoid overpenetrating the vault of the skull was also helpful. It was found that a non-screen film technic with the head in Towne's position, with 100 ma., 65 to 70 kv., and 1 second exposure with the Bucky diaphragm, produced films which showed both the inner

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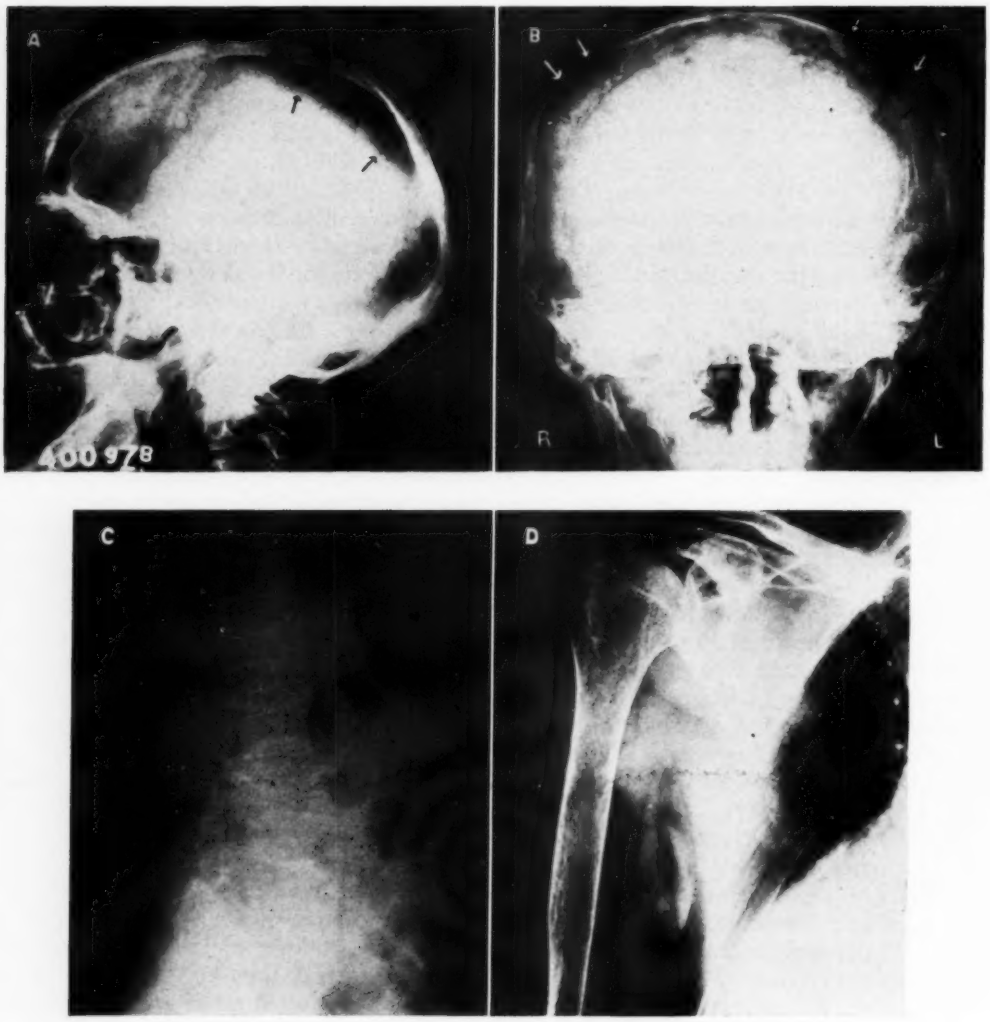

Fig. 1. Roentgenograms of a 58-year-old woman with postmenopausal osteoporosis.

A. Lateral view showing the characteristic oval rarefaction of parietal thinness in the parasagittal region (arrows).

B. Anteroposterior view. The parietal bones are thinned bilaterally. The outer table of the skull slopes toward the regions of parietal thinness, while the underlying inner table is not disturbed.

C. Lateral roentgenogram of the lumbar spine. There is marked osteoporosis, with compression changes in the third, fourth, and fifth lumbar vertebrae, and widening of the intervertebral spaces. The intervertebral disks assume a biconvex appearance.

D. Right humerus and shoulder. The cortex of the humerus is thinned and its medullary canal is widened.

and outer tables of the skull to best advantage. The lateral views were made in the routine fashion, and on these parietal thinness was visible as a somewhat elongated oval area of increased radiolucency in the upper posterior parietal regions.

Nineteen of the 26 patients in this series were women. For the entire group the age range was from fifty-four to eighty years. Sixteen patients were between sixty-one and seventy years old, and there were 5 each in the sixth and eighth decades.

Seven cases of parietal thinness were found after the patients had been referred

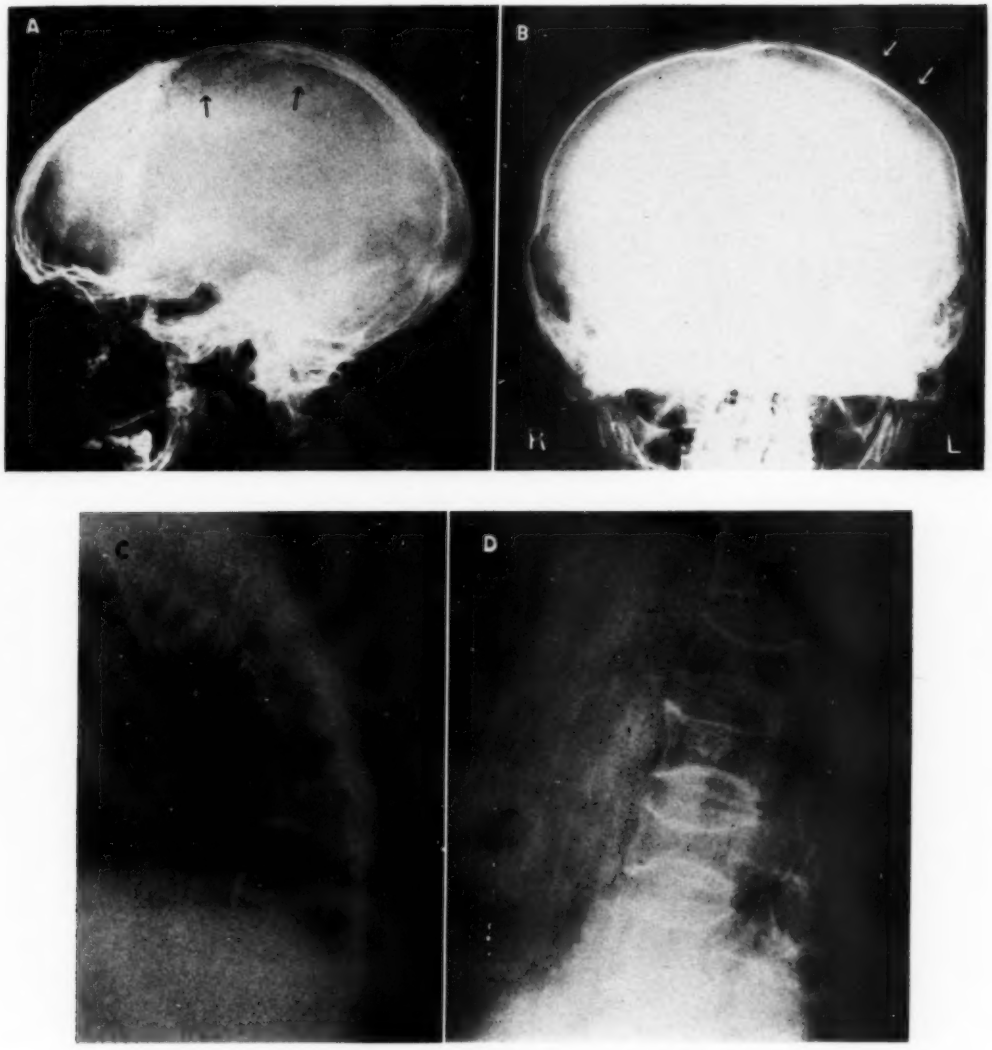

Fig. 2. Roentgenograms of a 74-year-old woman with senile osteoporosis.

A. Lateral skull roentgenogram showing a slight thinning of the bone in the upper parietal regions (arrows).

B. Anteroposterior view. The right parietal bone is intact. The outer table of the left parietal bone shows a slight but definite depression (arrows). Diploic markings are visible in both parietal regions.

C. Lateral view of thoracic spine. Compression changes are present in the middle and lower thoracic vertebrae, and considerable osteoporosis is visible.

D. Lateral view of lumbar spine, showing marked osteoporosis, compression changes, and widening of the intervertebral spaces.

for roentgenograms because of skull trauma, the finding being entirely incidental. Ten had been referred for spine and skull roentgenograms because of backache, with associated headache in 4 instances. In the remaining 9 cases osteoporotic changes in the dorsolumbar spine were observed on chest or abdominal examinations and the patients were recalled for skull roentgenograms because it was anticipated that parietal thinness might be encountered. Cervical spine roentgenograms were available in 5 cases, and in 10 films of the pelvis and extremities were also obtained.

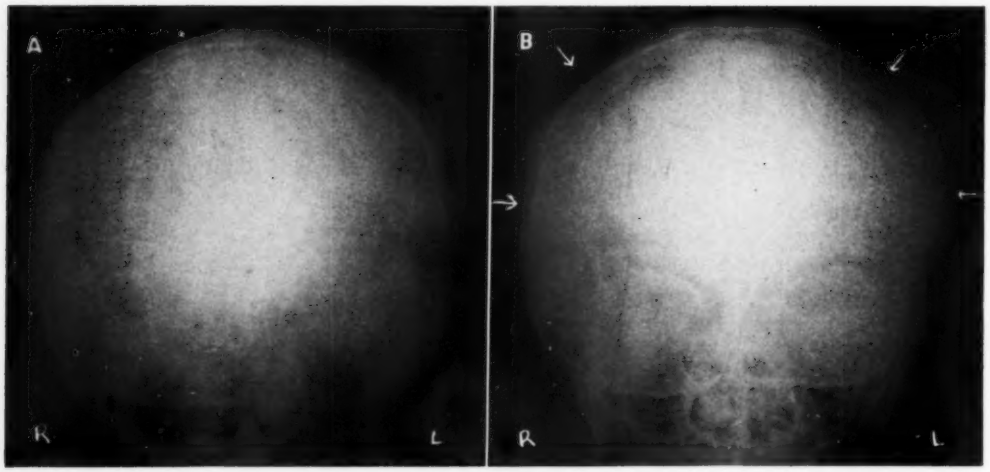

Fig. 3. A. Anteroposterior view, underexposed technic. There is a slight degree of parietal thinness on the right side. Postmenopausal osteoporosis.
B. Same case, with modified Towne's projection. The parietal thinness can be better visualized, and is seen to involve both sides (upper arrows). There is also thinness of the temporoparietal regions of lesser degree (lower arrows).

No symptoms referable to the skull were noted in the absence of a history of skull trauma or headache. The only finding of clinical interest other than the diffuse pain presented by 10 patients was the identification by palpation of a posterior parietal parasagittal indentation in cases of well marked parietal thinness (2). Determinations of blood calcium, phosphorus, and serum alkaline phosphatase were available in 6 cases and were normal in each. Blood counts and sedimentation rate determinations were normal in 10 cases in which they were available.

A review of the entire series of 26 cases showed parietal thinness of the flat type in 19. In 10 of these the degree of thinness was pronounced and symmetric bilaterally. In the remaining 9 the extent of the thinness was variable, with predominant involvement on one side. In 5 of the patients with asymmetric flat thinness it was possible to demonstrate diploic markings immediately beneath the depressed external skull table on the side with the lesser thinness. In 1 patient only one side was slightly depressed while the opposite parietal region was normal. In this instance diploic markings were present in both parietal bones. The inner table of the skull was not altered either in density or configuration in 16 cases; it was slightly to moderately decalcified in the others, all with advanced parietal thinness.

The grooved form of parietal thinness was present in 7 cases, and in all was asymmetrical. In 4 diploic markings were present beneath the thinned outer table of the skull, more prominently on the side with the lesser degree of thinness.

In 4 patients with moderate or advanced flat parietal thinness a similar type of bony change was observed in the temporoparietal regions in the frontal views. This was less pronounced than the parietal thinness.

The vault of the skull showed no other remarkable changes, and the vascular and suture patterns were normal. The sella turcica was normal in 23 cases and presented slight decalcification consistent with the patients' age in 3 instances. Twenty-two patients were edentulous, while the others were almost so. It was not possible to pass on the condition of the lamina dura of the teeth in any of this series.

The roentgenograms of the spine were of particular interest. Of the 19 cases for

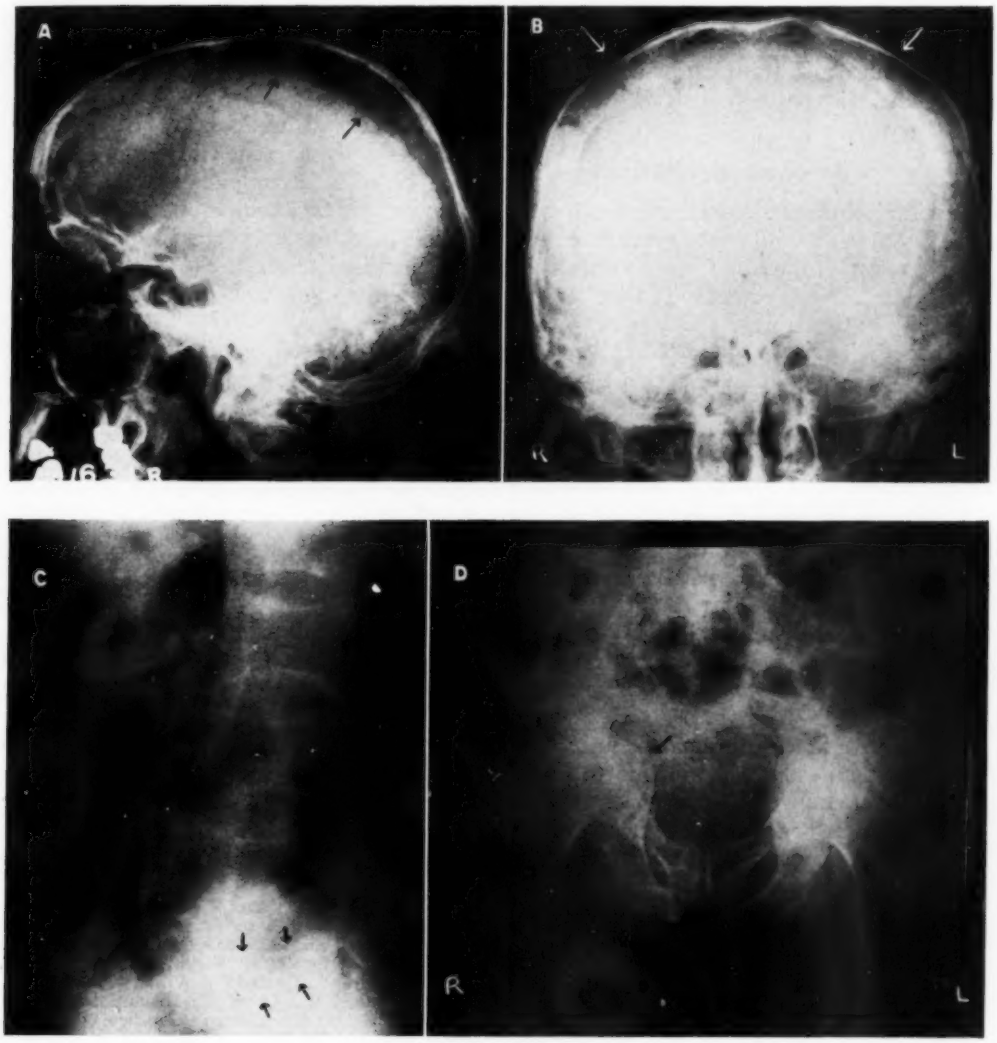

Fig. 4. Roentgenograms of a 63-year-old man with senile and probably nutritional osteoporosis.
A. Lateral skull roentgenogram showing thinness in the parietal region superiorly (arrows).
B. Flat parietal thinness present bilaterally (arrows).
C. Lateral lumbar spine. There is pronounced osteoporosis, with widening of the intervertebral spaces. A compression deformity is seen in the fifth lumbar vertebra (arrows).
D. Marked osteoporosis of the pelvis and upper femurs. The acetabular sockets protrude into the true pelvis (arrows).

which thoracolumbar views were available, 3 showed no changes. In 2 others there was slight osteoporosis with no alteration in the configuration of the vertebrae. In 14 cases definite osteoporotic changes were present, with diminished bone density and compression deformities in multiple vertebrae, together with widening of some of the intervertebral spaces. In the 5 patients with cervical spine roentgenograms, no bony changes were noted in this region.

Roentgenograms of the pelvis revealed moderate osteoporotic changes in 6 out of 10 cases, and in 1 other the osteoporosis was

severe. Studies of the upper and lower extremities showed widening of the medullary canals and thinning of the cortices consistent with osteoporosis in 7 out of 10 patients.

COMMENT

Parietal thinness is seen most often in elderly people, but its occurrence in younger age groups has been mentioned. Camp and Nash observed that 10 of their 119 patients were thirty years old or less, one being a four-year-old child while another was an infant of nine weeks. The predominance of women in the present series is at variance with the experience of Camp and Nash, but is more in accord with those observers who have referred to parietal thinness as a disease of old women.

The skeletal osteoporosis referred to in this report in conjunction with parietal thinness is the form described by Albright and Reifenstein (1) as a disease of tissue metabolism. This condition occurs in a postmenopausal form in women, a senile form, and a so-called idiopathic form with clinical manifestations similar to postmenopausal changes. Young patients with hypoestrinism or eunuchoidism might also present osteoporosis with spinal changes. It would be of interest to see how many patients with either parietal thinness or osteoporosis in a large series have concomitant changes. The present selected group of cases cannot be regarded as providing an accurate index as to the coincidence of these two conditions. Further reports as to this occurrence may possibly provide information leading to the true explanation of parietal thinness.

Osteoporosis associated with other conditions such as multiple myeloma, Cushing's disease, hyperparathyroidism, and acromegaly, are accompanied by radiologic and clinical attributes which point toward their diagnosis and require no further mention here.

SUMMARY

1. Parietal thinness may occur in a symmetric or asymmetric form, and in some cases is accompanied by a similar thinness in the temporoparietal region. Diploic markings are often present beneath the depressed outer table of the skull in cases with moderate or slight parietal thinness.

2. The coexistence of parietal thinness with skeletal osteoporosis believed to be of benign postmenopausal or senile origin, or of idiopathic nature, is reported. It is suggested that this may indicate a possible etiologic relationship between these conditions.

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SUMARIO

La Concurrencia de Adelgazamiento Parietal con Osteoporosis Senil Postmenopáusica o Idiopática

La serie presentada comprende 26 casos de adelgazamiento de los huesos parietales. Diecinueve de los enfermos eran mujeres y la edad para todo el grupo variaba de cincuenta y cuatro a ochenta años. El único síntoma de valor clínico, aparte del dolor difuso en 10 pacientes, fué la identificación, por la palpación, de una indentación parasagital parietal posterior en los casos más graves.

En 19 de los casos, el adelgazamiento era del tipo rectangular o "plano" y en el resto tenía configuración acanalada. En 10 de los del primer grupo, el estado era simétrico bilateralmente, y en todos los restantes, asimétrico. A menudo observábanse señales del diploe debajo de la deprimida tabla externa del cráneo cuando el adelgazamiento parietal era moderado o leve.

En 14 de los 19 casos para los cuales había radiografías toracolumborraquídeas, notábanse alteraciones osteoporóticas bien definidas y las radiografías de la pelvis revelaron lo mismo en 6 de 10 casos. Esta coexistencia de adelgazamiento de los huesos parietales con osteoporosis esquelética, considerada como de origen postmenopáusico o senil benigno, o de naturaleza idiopática, sugiere una posible relación etiológica entre ambos estados mencionados.

The Diagnosis of Volvulus of the Cecum[1]

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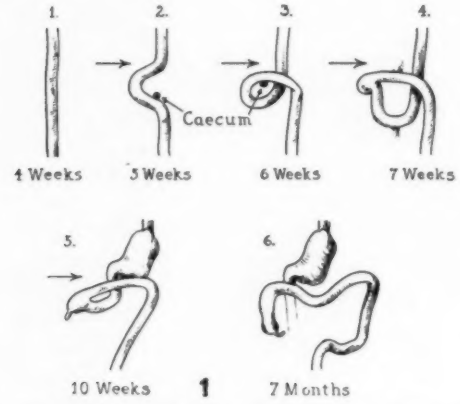
VOLVULUS IS A twisting of the bowel which produces luminal occlusion. When it occurs in the cecum, the clinical findings are those of intestinal obstruction of sudden onset, the cause of which is obscure. The radiologic observations, however, may be strikingly diagnostic. In spite of the fact that cecal volvulus constitutes a radiologic entity, there is a remarkable paucity of comment on this type of acute abdominal crisis in the radiologic literature. Indeed, during the past fifteen years, not a single American radiologic journal has published an original article on volvulus of the cecum. The present report is based on 7 proved cases and emphasizes the radiologic criteria for diagnosis.



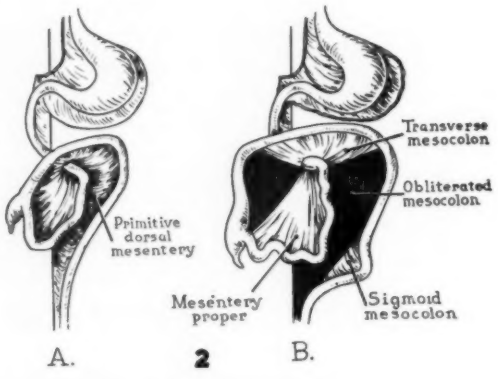


Fig. 1. Diagrammatic representation of the embryonic development of the intestinal tract. Note that 1–4 are side views, whereas 5 and 6 are frontal views of the developing bowel.

Fig. 2. Fusion of the mesocolon. A. At three months, prior to fusion. B. At six months, fusion of ascending and descending mesocolon complete (after Arey).

The term "volvulus of the cecum" is somewhat of a misnomer, since in every case more or less of the ascending colon and terminal ileum participates in the twist. The first description of cecal volvulus was made by Rokitansky in 1841 (29). Since that time, many cases have been reported, and by 1942, Wolfer, Beaton and Anson were able to collect over 300 examples from the literature (33). During the past ten years, at least 60 additional cases have been described (6, 8, 10–12, 16, 17, 20, 21, 25, 28, 34). Most of these earlier cases were discovered on the autopsy table, and it was not until recent years that survival became the rule rather than the exception (6). In a review of 100 reported cases, Donhauser and Atwell, in 1949, stressed the grave prognostic implications of gangrene and pointed out that most of the survivors have been operated upon within twenty-four hours after the onset of symptoms (8). Early recognition, then, is imperative. It is possible only where awareness of the entity coincides with knowledge of its clinical and roentgenographic manifestations.

ETIOLOGY

The factors implicated in the precipitation of volvulus of the cecum are legion.

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Previous operations (7, 23), bands (25), tumors (25), hernias (5), violent coughing (33), pregnancy (2, 18, 24, 26), mesenteric cysts (22), typhoid fever (13), excessive physical exertion (26, 33), over-eating (26, 31), abdominal trauma (33), diet (13), constipation (25)—all these and many more possible causes have been mentioned. In our own cases, it was impossible to discern any common precipitating factor. It is probably more important to understand the basic anatomic abnormality without which volvulus could not occur, namely, excessive mobility of the cecum and ascending colon.

The embryonic intestine, which at four weeks of life is a simple tube, shortly thereafter undergoes ventral flexion, forming a horizontal U-shaped loop (Fig. 1). At this time, the cecum first appears as a bulge in the caudal half of the loop; by six weeks, rotation of the loop about the superior mesenteric artery brings the cecum from an inferior to a superior position to the left of the mid-line. From seven to ten weeks, the developing bowel is herniated into the umbilical cord; at the end of this period, there is a sudden return of the intestine into the abdominal cavity. Concomitantly, the cecum moves to the right, under the liver, and in the course of the next few months it descends into the right lower quadrant (1).

During this period, the primitive dorsal mesentery develops rapidly and undergoes corresponding torsion. The colon remains freely movable in the abdominal cavity until about the middle of the fourth month of fetal life, at which time the ascending and descending mesocolon carry the corresponding portions of the colon far laterad. This lateral movement brings the mesocolons into apposition with the posterior body wall, and results in fusion with the adjacent peritoneum and consequent fixation of the ascending and descending colon (Fig. 2). If there is absence of normal rotation of the intestine, or if the chain of events which eventually results in the cecum being in the right lower abdomen is interrupted at any point, the cecum will be freely movable. Similarly, incomplete obliteration of the ascending mesocolon, even in the presence of a normally located cecum, will result in inadequate fixation of the cecum and part of the ascending colon. Of the two, failure of mesenteric fusion is a far more common etiologic factor than failure of rotation (33).

Under normal circumstances, the cecum retains a moderate degree of mobility into adult life. Obviously, it is *excessive* mobility that is a prerequisite for volvulus. Some observers have reported the presence of an ascending mesocolon in 13 to 33 per cent of newborn infants (14, 30), and in adults a hypermobile cecum has been noted in 10 to 26 per cent of different series (3, 4, 32, 33). Estimates as to the incidence of cecal volvulus as a cause of intestinal obstruction range from 1.2 to 11.6 per cent (15, 26, 31). In our experience, it is an uncommon but hardly rare cause of bowel obstruction.

Perhaps one explanation for the infrequency of cecal volvulus in view of the relatively high incidence of a hypermobile cecum is that hyperfixation of the ileum or ascending colon, which is important in providing the fixed point around which the cecum rotates (31), does not occur commonly in association with a cecal hypermobility (33). Furthermore, even when the anatomic prerequisites are fully met, there must be in addition an inciting factor prior to the occurrence of volvulus.

AGE AND SEX INCIDENCE

Cecal volvulus is generally described as a disease of young adults, with peak occurrence in the third and fourth decades. In 5 of our series it occurred in the fifth and sixth decades of life. Our youngest patient was forty and our oldest eighty-four years of age.

Although some authors feel that there is a higher incidence among males (33), there was an equal sex distribution in 100 cases recently reviewed (8). Of the patients in our series, 6 were female and 1 male.

PREVIOUS HISTORY

Only 3 of our patients gave a history of previous attacks of abdominal pain. One patient had had a previous operation; none was pregnant. These findings are somewhat at variance with the relative frequency of previous symptoms, operations, or pregnancy in cases recorded in the literature.

SYMPTOMS

In only a single instance was a history of pain absent, and this was presumably because the patient was unable to communicate. All of the other patients complained of sharp, crampy abdominal pain. In some, the pain was generalized; when localized, it showed a slight predilection for the right lower quadrant as the site of greatest intensity. Nausea and vomiting were present in all but 2 patients. All patients had obstipation for a varying length of time following the initial complaints. The duration of symptoms varied from eight hours to six days, with most patients having symptoms for at least two days prior to diagnosis and surgery. Abdominal pain, nausea and vomiting, and obstipation of variable duration are the symptoms commonly recorded in the literature (25).

PHYSICAL FINDINGS

Tende ss was present in 6 of the 7 patients in our series; it was generalized in 4, and localized to the right lower quadrant and the right upper quadrant, respectively, in 1 each. The abdomen was distended in all but 2 patients. In only 1 case was a palpable mass noted, and this was in the right lower quadrant. Rigidity and spasm were uncommon findings. Peristaltic sounds were heard in all but 1 patient.

In 6 of 7 patients, the white blood cell count was elevated significantly.

ROENTGEN EXAMINATION

Plain Films: The *stomach* contained a moderate amount of gas in some of the cases but was not significantly dilated.

Dilated loops of *small bowel* were present in every case. There was, however, marked variation in the degree of dilatation, and in some instances it was not significant enough to allow a diagnosis of small bowel obstruction. In most instances the distention was moderate, in some marked.

The *large bowel* showed a significant absence of gas in the rectum, rectosigmoid, descending colon, and transverse colon, with 1 exception, a patient who shortly before examination had received a soap and water enema. Only once was fecal material visible in the transverse and descending colon. The striking finding in each case was a huge gas-filled loop of bowel in the abdomen. The location of this loop was by no means constant; it was present in at least 1 case in each quadrant of the abdomen, as well as in the pelvis. In general, the axis of the loop seemed to originate in the right lower quadrant rather than in the left. The statement has been made that in 90 per cent of the cases the dilated cecum is in the left upper quadrant (34).

Decubitus Films: Decubitus films were obtained in a few of our cases and were helpful in demonstrating the presence of a fluid level in the dilated gas-filled loop, as well as in small-bowel loops in a few cases.

Barium Enema: Barium enema examinations were performed in 4 cases. In all of these a complete obstruction of the large bowel was demonstrated, usually in the ascending colon or near the hepatic flexure. In 1 case, the twist in the ascending colon was clearly demonstrated and left no doubt as to the nature of the obstruction (Fig. 3). In each instance the large gas-filled loop failed to fill with barium and was shown to be directly adjacent to the site of a mechanical obstruction in the ascending colon.

OPERATIVE FINDINGS

All of the patients were explored, and in all of them volvulus of the cecum was found, with massive distention of the cecum.

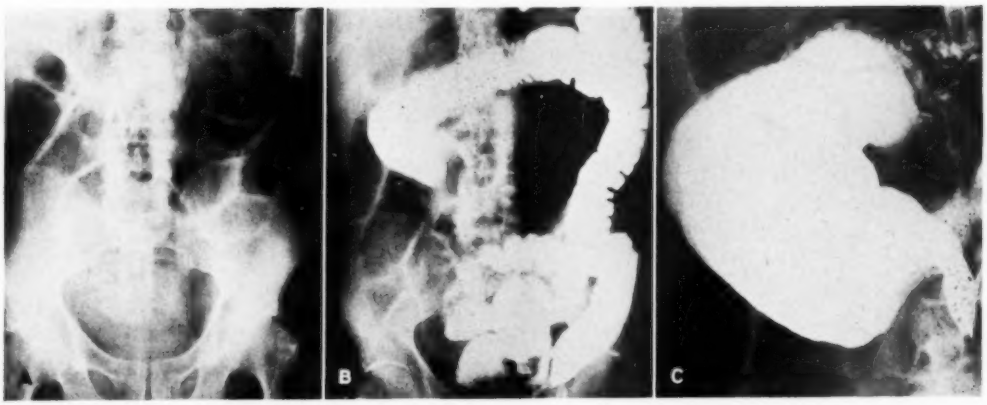

Fig. 3. Case I: Volvulus of the cecum. A. On the plain film, a large gas-filled loop extends into the left upper quadrant. Multiple dilated small bowel loops are visible.
B. A barium enema demonstrates an obstructing lesion in the ascending colon.
C. Close-up of the twisted, cork-screw-like mucosal folds at the site of volvulus.

TREATMENT

Reduction of the volvulus was the sole treatment in 2 patients. In 1 case the cecum was fixed following detorsion, and in another fixation was accompanied by cecostomy. In all the remaining cases colostomy was performed; in 2 resection of the cecum and part of the ascending colon was also necessary.

PROGNOSIS

The prognosis in cecal volvulus has improved notably within the last few years. Until recently the mortality was about 50 per cent (33). In 1947, Young reported 7 cases with but 1 death (14), and in 1948, Dixon and Meyer reported 13 cases with no death (7). Uneventful recovery occurred in all but 1 of our cases, in which death ensued the day following operation, after a bout of marked abdominal distention, high fever, and respiratory distress. No autopsy was performed on this patient.

CASE HISTORIES

CASE I (Fig. 3): A. H., a 58-year-old man, entered the hospital on Nov. 14, 1947, complaining of generalized abdominal pain and vomiting of three days duration. During this time he had had no bowel movements or passage of gas. The past history was non-contributory.

The patient appeared acutely ill, with a temperature of 102.4°, generalized abdominal tenderness, and considerable spasm, but no other pertinent physical findings. The white blood cell count was 11,500, with 90 per cent polymorphonuclears.

Radiologic Examination: Plain roentgenograms of the abdomen showed some dilated loops of small bowel and a single large gas-filled loop extending into the left upper abdomen. A barium enema study showed normal filling of the sigmoid and of the descending and transverse colon. Just proximal to the hepatic flexure of the colon was an obstruction to the flow of barium. At this point there was evidence of twisting of the mucosal folds adjacent to the large gas-filled loop, and a diagnosis of volvulus of the cecum was made.

Surgical Findings: At operation, volvulus of the cecum was found. The cecum was massively dilated, extending from the right lower quadrant up into the left upper quadrant and measuring approximately 15 cm. wide and 25 cm. long. After reduction of the volvulus, the cecum was fixed to the lateral peritoneal wall, and a small gangrenous area, through which leakage of bowel contents into the peritoneal cavity had occurred, was inverted. The abdomen was closed.

Course: The patient was sent back to the ward in apparently good condition, but his temperature rose suddenly to 106° and he became very cyanotic. Great respiratory distress and abdominal distention developed and death occurred the day following operation. An autopsy was not done.

CASE II (Fig. 4): L. S., a 45-year-old woman, entered the hospital May 6, 1945, with abdominal pain and nausea of two days duration. The night before admission, the pain became more intense and began to localize in the right lower quadrant. There was no history of similar episodes of pain nor of operations.

The pertinent physical findings were limited to

Fig. 4. Case II: Volvulus of the cecum. Plain film of the abdomen showing a large gas-filled loop in the mid-abdomen, which proved to be the dilated cecum. A moderate amount of gas is present in the stomach. Dilated small-bowel loops are noted in the pelvis.

the abdomen. There was moderate right lower quadrant spasm, with tenderness and rebound tenderness. No mass was felt. The temperature was 99.4°.

Radiologic Examination: A plain film showed a large gas-filled loop of bowel in the mid-abdomen. Dilated small-bowel loops were also noted, and there was a moderate amount of gas in the transverse and descending colon, perhaps the result of a previous enema. The diagnosis was probable volvulus of the cecum.

Surgical Findings: On exploration, volvulus of the cecum was found, with a closed-loop obstruction, producing a greatly dilated, thin-walled cecum in the central portion of the abdomen. The volvulus had occurred around a firm fibrous adhesion between the lateral abdominal wall and the lateral aspect of the cecum. The adhesion was cut, the volvulus reduced, and the cecum anchored to the lateral peritoneal surface. Recovery was uneventful.

CASE III (Fig. 5): L. M., a 65-year-old white woman entered the hospital on Nov. 1, 1948, because of abdominal cramps and obstipation of two days duration. The onset was sudden, with severe knife-like right lower quadrant pain, recurring and becoming more diffuse until admission. Five months earlier there had been an episode of constipation lasting two days, accompanied by sharp, cramping, lower abdominal pains. These were alleviated following an enema and ingestion of mineral oil.

The patient exhibited mild generalized abdominal tenderness. A 5-cm. right pelvic mass was palpable. The temperature was normal.

Radiologic Examination: A plain roentgenogram of

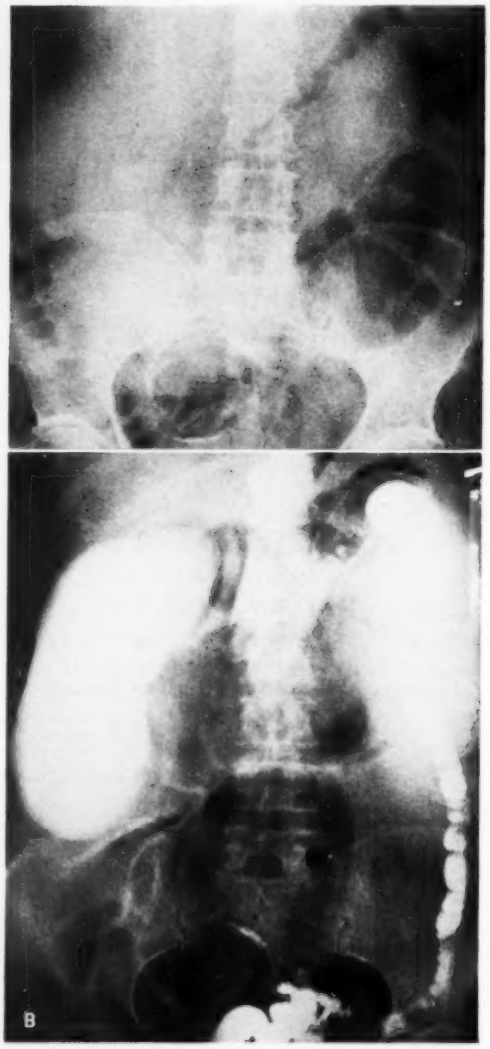

Fig. 5. Case III: Volvulus of the cecum. A. Plain film showing a slightly dilated large-bowel loop in the left lower quadrant. A calcified mass is present in the right pelvis.

B. Five days later, a huge distended cecal loop is present in the left lower quadrant and mid-abdomen. Barium enema shows an obstruction in the ascending colon adjacent to the distended loop.

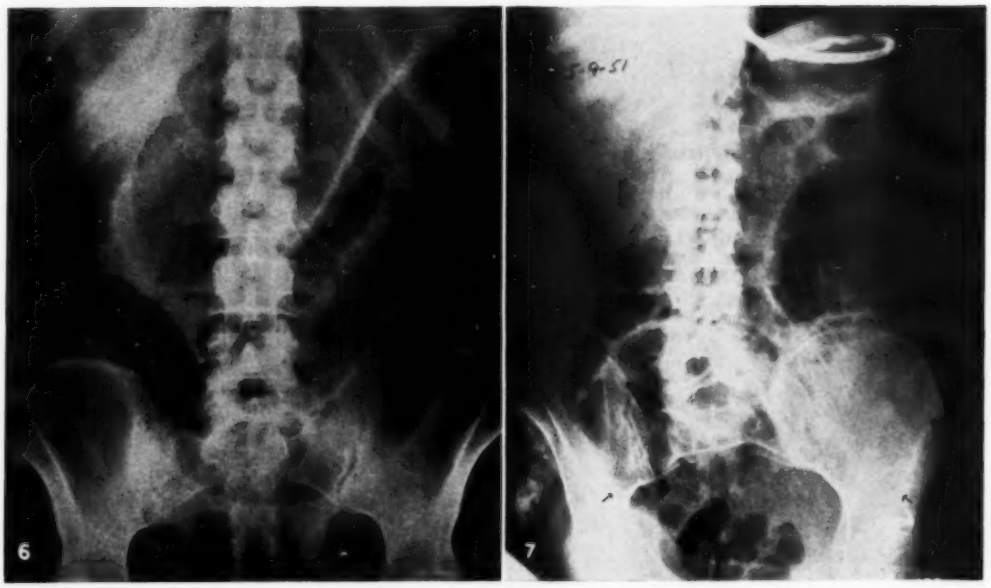

Fig. 6. Case IV: Volvulus of the cecum. A large gas-filled loop extends into the left upper quadrant and there are multiple dilated small-bowel loops. Note the lamellated gallstone. At operation, 360° torsion was found.

Fig. 7. Case V: Volvulus of the cecum. Plain film of the abdomen showing a huge gas-filled loop of bowel in the left lower quadrant and pelvis. There are multiple dilated loops of small bowel.

the abdomen revealed a dilated loop of large bowel in the left lower quadrant and a calcified mass in the right pelvis. A barium enema study showed an apparent obstruction in the mid-transverse colon. After an interval of five days, a repeat examination showed a huge gas-filled loop in the mid-abdomen and pelvis, and some dilated small-bowel loops as well. A barium enema demonstrated an obstruction of the ascending colon.

Surgical Findings: At operation, volvulus of the cecum was found, with a torsion of 360 degrees in a clockwise direction. The cecum was huge. In addition, a right ovarian cyst was present, to which a part of the greater omentum had become adherent, compressing and partially obstructing the mid-transverse colon. The volvulus was reduced, and a right colectomy and ileo-transverse colostomy done. The patient had an uneventful recovery.

CASE IV (Fig. 6): V. C., a 48-year-old female, entered the hospital on June 27, 1951, with nausea, crampy peri-umbilical pain, abdominal distention, and obstipation of two and a half days duration. She had not vomited. She gave no history of abdominal surgery, although she had been treated with irradiation for carcinoma of the nasopharynx and for an independent primary carcinoma of the breast.

The abdomen was tympanitic, with slight tenderness throughout, but no true rigidity or spasm. No masses were felt. The patient was afebrile.

Radiologic Examination: A plain film of the abdomen showed multiple dilated small-bowel loops, as well as a large gas-filled loop of bowel extending up into the left upper quadrant. In addition, a gallstone was noted in the right upper quadrant, surrounded by a pocket of gas, thought to be in the bowel. No gas was seen in the ascending, transverse, or descending colon.

Surgical Findings: At operation the entire left upper quadrant was found to be filled with a distended mass, the size of a small football, which proved to be the cecum. It had rotated 360 degrees, at the level of the ileocecal valve. The cecum and part of the ascending colon had no attachment to the right colic gutter. The volvulus was reduced, and a colostomy performed, with an uneventful recovery.

CASE V (Fig. 7): L. J., a 59-year-old woman, entered the hospital on April 23, 1951, complaining of burning epigastric pain of six weeks duration, occasionally relieved by milk. There was moderate mid-epigastric tenderness. Peptic ulcer was suspected, and an ulcer regime was instituted. Ten days after admission, on May 3, right upper quadrant pain suddenly developed, accompanied by nausea and vomiting. Mild abdominal distention and right abdominal tenderness were present.

Radiologic Examination: A plain roentgenogram of the abdomen showed a distended left lower quad-

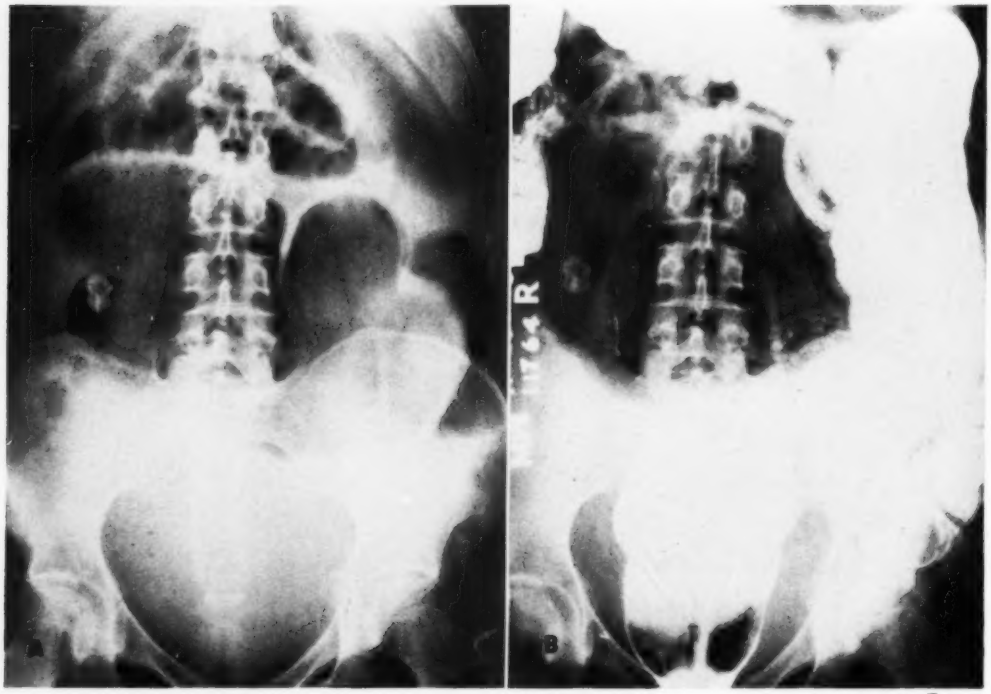

Fig. 8. Case VI: Volvulus of the cecum. A. A large gas-filled loop is present in the mid-abdomen. Dilatation of small-bowel loops is also noted.
B. Barium enema shows an obstruction in the ascending colon, just distal to the distended cecal loop.

rant loop. A diagnosis of cecal volvulus was suggested, but the surgeons elected to delay operative intervention. Wangensteen suction was begun, and further films were obtained five days later, at which time a huge gas-filled loop of bowel was even more prominent.

Surgical Findings: At operation a "large tense mass filled the whole lower abdomen." This was found to represent a tremendously dilated cecum, with a long mobile mesentery which had rotated clockwise about 180 degrees, producing a volvulus. The volvulus was reduced and a cecostomy was performed. Stones were palpated in the gallbladder. Recovery was uneventful.

CASE VI (Fig. 8)[2]: M. J., a 53-year-old woman, entered the hospital Nov. 25, 1950, with cramp-like generalized abdominal pain, nausea, vomiting, and abdominal distention of one day duration. For the preceding twelve hours, she had had no bowel movement and an enema a few hours before admission yielded no results. A few years before, a similar episode had occurred, lasting for a few hours, with spontaneous subsidence of symptoms. The patient had parkinsonism following a bout of encephalitis many years before.

[2] Kindness of Dr. Dan Tucker.

There was moderate abdominal distention, and an ill defined mass was felt in the right abdomen. The white blood cell count was 22,700, with 91 per cent polymorphonuclear leukocytes.

Radiologic Examination: Plain roentgenograms of the abdomen showed moderate small-bowel dilatation and a large gas-filled bowel loop in the mid-abdomen. On the barium enema film, obstruction of the colon was manifest just proximal to the dilated bowel loops. A diagnosis of cecal volvulus was made.

Surgical Findings: At operation, volvulus of the cecum was found, with a huge cecum, approximately 15 × 10 × 10 cm. It was necessary to turn the mass 320 degrees clockwise, following which there was complete relief of the closed loop obstruction. A long cecal mesentery was noted. Uneventful recovery followed.

CASE VII (Fig. 9)[3]: H. G., an 84-year-old woman, entered the hospital on Feb. 11, 1951, because of vomiting, anorexia, and abdominal distention. The patient was an invalid, and in constant care of a nurse, who two days before admission had noticed a soft swelling in the right lower abdomen. Following an enema the swelling disappeared. On the day be-

[3] Kindness of Dr. Dan Tucker.

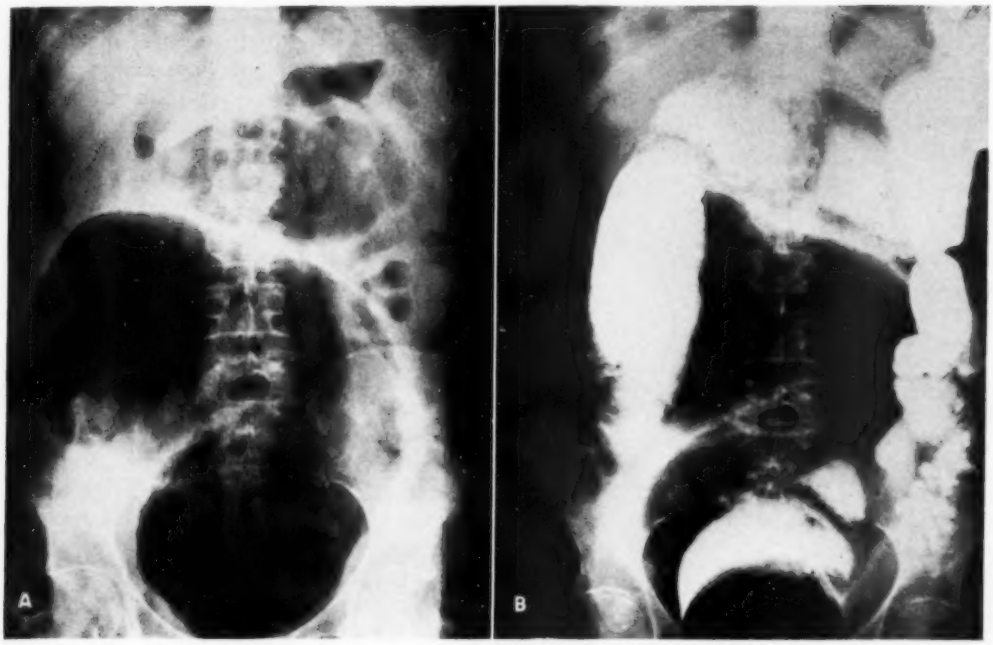

Fig. 9. Case VII: Volvulus of the cecum. A. Plain film of the abdomen showing a huge loop of bowel in the pelvis and right lower quadrant. Relatively little small-bowel distention is present.
B. Barium enema study. The flow of barium is obstructed in the ascending colon, adjacent to the dilated cecum.

fore admission, however, vomiting and anorexia occurred, and the abdomen became markedly distended. The patient had had a cerebral accident many years before and had been spastic and unresponsive for about a year.

The abdomen was distended and there was involuntary guarding. Diffuse abdominal tenderness was present, and no masses were felt. The white blood cell count was 13,800, with 90 per cent polymorphonuclears.

Radiologic Examination: A plain roentgenogram of the abdomen showed a huge bowel loop in the pelvis and right lower quadrant. A barium enema study showed obstruction of the flow of barium in the ascending colon, just adjacent to the distended loop of bowel. The diagnosis was volvulus of the cecum.

Surgical Findings: At operation, the cecum was found to have rotated one and one-half times on itself and was large and discolored. In its surface were numerous pin-point openings. There was a very long mesenteric attachment. The volvulus was reduced, the cecum resected, and an ileo-ascending colostomy performed. The patient had an uneventful recovery.

DISCUSSION

It should be apparent from the foregoing that the clinical data alone are inadequate for establishing the diagnosis of volvulus of the cecum. Certainly intestinal obstruction can be suspected on the basis of clinical findings, but the nature of the obstruction must remain obscure without roentgenographic investigation. With an adequate roentgen examination, the diagnosis should become clear.

On plain films, a massive gas-filled loop of bowel is seen in one of the quadrants of the abdomen, or in the mid-abdomen or pelvis. The axis of this bowel loop is such that it usually points in the direction of the right lower quadrant, no matter in which portion of the abdomen it is. This may aid in differentiation from sigmoid volvulus, in which the axis of the distended loop usually points in the direction of the left lower quadrant or pelvis (Fig. 10). In sigmoid volvulus, the two sides of the closed loop of sigmoid colon frequently can be seen rising in an almost vertical direction from the pelvis.

Fig. 10. Volvulus of the sigmoid. A large gas-filled loop extends from the left lower quadrant into the upper abdomen. There is distention of the descending, transverse, and ascending colon. The patient was a 54-year-old woman with a five-day history of crampy left lower quadrant pain and increasing abdominal distention. At operation, the sigmoid volvulus was reduced and the sigmoid exteriorized.

A further differential point is that in volvulus of the cecum no gas is seen in the transverse or descending colon, whereas these portions of the colon are distended in sigmoid volvulus.

The distended cecal loop may extend into the left upper quadrant and simulate the appearance of the stomach. This occurred in one of our cases, in which the radiologist suspected that it represented a dilated stomach. With a tube in the stomach attached to a suction apparatus, the failure of the loop to be deflated immediately demonstrates that it is not stomach. Similarly, a small amount of barium may be run through the tube into the stomach, delineating its contours.

Slight to marked small-bowel distention is present. The appearance, on the plain film of the abdomen, of the ileocecal valve protruding into the large loop of cecum has also been stressed (20). We have not been impressed by this finding.

If the plain-film findings are inadequate for diagnosis, the instillation of barium in the colon will show a collapsed but patent descending and transverse colon, and the barium column will suddenly be obstructed at some point in the ascending colon. This point is always adjacent to the large gas-filled loop. At times a small amount of barium may seep into this loop, or a nice demonstration of the actual twist of the bowel will be obtained. Not only will the barium enema rule out sigmoid volvulus but, also, the demonstration of an obstructing lesion in the ascending colon associated with the distended bowel loop militates against the gas collection representing a cyst or a gas-filled bladder.

In most cases, the preoperative diagnosis of volvulus of the cecum can be made with adequate roentgenologic procedures, properly evaluated. Because of the importance of early recognition, the diagnosis should be kept in mind in every case of intestinal obstruction.

SUMMARY

Volvulus of the cecum is an acute abdominal emergency in which a twist at or above the cecum produces luminal occlusion. As a prerequisite for its occurrence, there must be excessive mobility of the cecum. The clinical symptoms are those of intestinal obstruction: abdominal pain, nausea, vomiting, and obstipation. On physical examination, tenderness, distention, and, rarely, a mass are present.

Roentgenologic examination is diagnostic. On the plain films, a huge dilated loop of bowel is noted, usually extending from the right lower quadrant into any other quadrant of the abdomen or into the pelvis. Mild to moderate small bowel distention is noted, but the distal colon is collapsed. A barium enema study demonstrates obstruction in the ascending colon, adjacent to the dilated cecal loop.

The discussion is based on 7 proved cases and a review of the literature.

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SUMARIO

El Diagnóstico del Vólvulo del Ciego

El íleo cecal representa una emergencia abdominal aguda, en la que una torsión en el ciego o un poco más arriba produce oclusión de la luz del mismo. Como *sine qua non* para su ocurrencia, debe haber hipermovilidad del ciego. Los síntomas clínicos son los de la oclusión intestinal: dolor abdominal, náuseas, vómitos y obstipación. En el examen físico, obsérvanse hiperalgesia, distensión y, raramente, tumefacción.

El examen roentgenológico es diacrítico. En las radiografías simples, nótase un asa intestinal dilatada y enorme, que suele extenderse de la fosa ilíaca derecha a cualquier otro cuadrante del abdomen o hasta la pelvis. Obsérvase distensión del intestino delgado, que varía de leve a moderada, pero la porción distal del colon está aplastada. El estudio con enema de bario revela un sitio ocluído en el colon ascendente, adyacente al asa cecal dilatada.

Esta reseña se basa en 7 casos comprobados e ilustrados con grabados y en un repaso de la literatura.

Gastric Varices[1]

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THE PURPOSE OF this paper is to describe the roentgen appearance of gastric varices, to define other abnormal changes from which they must be distinguished, and to re-emphasize the frequency of their occurrence along with esophageal varices in portal hypertension.

The medical literature prior to 1928 contains many references to postmortem reports of esophageal and gastric varices. Stadelmann (10), in 1913, reported on 2 patients with exsanguinating hemorrhage from gastric varices. The first antemortem demonstration of esophageal varices by roentgenologic methods was achieved in 1928 by Wolf (12). Shortly following this there were further reports on the roentgenographic appearance of both esophageal and gastric varices by Schatzki (9), Brdiczka and Tschakert (1), Eisler (2), and Pape (5). The latter two authors showed that large varices may produce contour changes and filling defects of the fundus of the stomach similar to those caused by a neoplasm.

Gastric varices have received much less attention in the literature than their esophageal counterparts. The two types of varices usually coexist in chronic hypertension of the portal system, and the term "gastroesophageal" is aptly applied to these cases. Phemister and Humphreys (7), in a report of 2 cases of gastroesophageal varices secondary to Banti's disease, state that under certain conditions the gastric component may provide a greater danger of hemorrhage than the esophageal. These authors attribute the lack of emphasis on gastric hemorrhage associated with gastroesophageal varices to the fact that bleeding may occur without gross erosions. Hence, the source is not readily diagnosed roentgenologically or postmortem.

The venous drainage of the upper third of the stomach begins in the capillary plexuses around the gastric glands. These plexuses unite to form a network throughout the submucosa from which branches pierce the muscular coat and unite to form the following veins: the right gastroepiploic, which joins the superior mesenteric; the left gastroepiploic, which drains into the splenic vein; the vasa breva or short gastric veins (usually four or five in number), which drain the fundus of the stomach and empty into the splenic vein; the coronary vein, which runs along the lesser curvature, drains the cardia, and usually empties into either the portal or splenic vein. The coronary vein forms an anastomotic plexus with the venous network about the distal esophagus. These latter veins drain into the hemiazygos, which in turn drains into the caval system (Fig. 1). The above-mentioned veins contain numerous valves, competent in the child but rarely so in the adult (6).

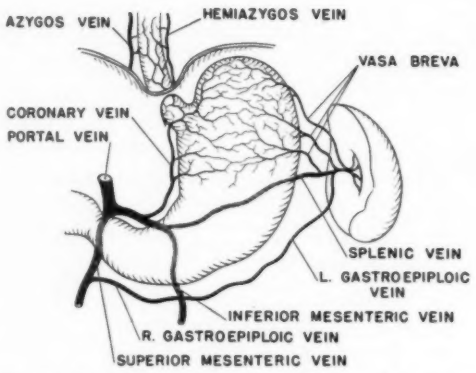


Fig. 1. Schematic drawing of the venous drainage of the distal esophagus, stomach, and spleen.

Portal cirrhosis causes varying degrees of disturbance of liver function, but the most prominent effects are the result of obstruction to the portal circulation. Such

[1] From the Department of Radiology, The New York Hospital, Cornell Medical Center, New York. Accepted for publication in March 1952.

obstruction produces chronic passive congestion of the tissues drained by the portal vein, *i.e.*, the spleen and much of the intestinal tract. Extrahepatic obstruction of the portal system, as well as portal cirrhosis, will cause distention and engorgement of the gastric veins, compelling the venous drainage to be directed through the adjoining anastomotic veins of the hemiazygos system.

The richly anastomosing submucosal veins of the distal esophagus are poorly supported. This explains why the lower esophagus is a site of predilection for varices. For this same reason, venous rupture with massive hemorrhage is more apt to occur here than elsewhere (Fig. 2). McIndoe (4) believes that trauma incident to changes in respiratory dynamics or food particles may be a contributing cause of hemorrhage. In cirrhosis and in portal hypertension, deficiency of vitamin K, hypoproteinemia, venous stasis and congestion probably produce nutritional disturbances of the mucosa which render it susceptible to ulceration, infection, or trauma. That portal hypertension itself is a factor is supported by experimental studies of Wangensteen (11). He was able to produce a greater number of peptic ulcerations in experimental animals with portal hypertension by the application of histamine-impregnated beeswax than in a group without portal hypertension. Necropsy often reveals mucosal erosions overlying esophageal or gastric varices. Some believe that in the esophagus such ulcerations are the result of reflux esophagitis.

For better interpretation of the roentgen changes produced by gastric varices, a review of the normal mucosal appearance of the upper third of the stomach will be helpful. The mucosal pattern here has a more variegated appearance than in the rest of the stomach. This is especially so in the fundus. The rugae are irregular, appear interrupted, and in the region of the greater curvature are normally coarser than elsewhere. They show a tendency to become broken up into secondary transverse and oblique folds.

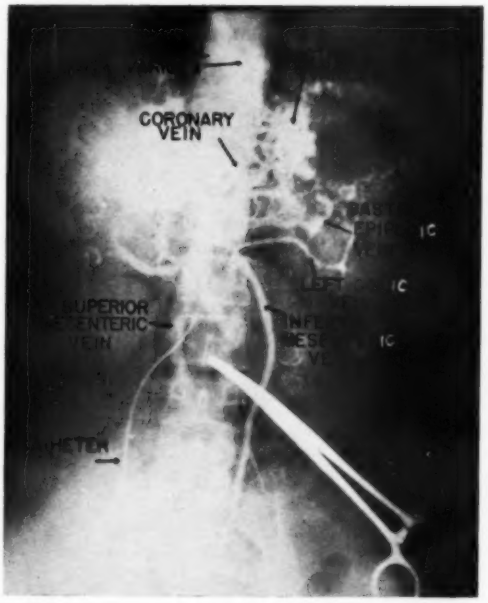


Fig. 2. Portal venogram of 14-year-old girl with Banti's disease, portal hypertension, and esophageal and gastric varices. A splenorenal shunt was unsuccessful. This portal venogram was obtained preliminary to a second operation which placed a femoral vein graft between the large, dilated superior mesenteric vein and inferior vena cava. Note the large, tortuous coronary vein and varices involving the cardia and fundus of the stomach.

The presently held opinions on the form and the functions of the gastric mucosa are based on the researches of Forssell (3). He stated that physiological changes in the gastric rugae occur as the result of the autonomic activity of the muscularis mucosae. The muscularis mucosae determines the number and shape of the rugae, whereas the vascularity influences their size and coarseness.

In cirrhosis with portal hypertension, edema of the mucosa of the digestive tract occurs as a result of hypoproteinemia and venous congestion. Roentgenologically this often results in a general coarsening of the mucosal pattern of the bowel.

Gastric varices produce two important roentgen findings which, while not specific, are nonetheless sufficiently suggestive to warrant the diagnosis. One of these is the presence of smooth, lobulated filling defects of the cardia or fundus, reflecting external

Fig. 3. Roentgenogram from a gastrointestinal series of a 69-year-old female admitted to the hospital because of hematemesis. There was a similar episode ten years prior to the present admission. Esophageal varices were not demonstrated on the gastrointestinal examination. The stomach revealed lobulated filling defects in the region of the gastric cardia, simulating a gastric neoplasm. Surgical exploration revealed severe cirrhosis of the liver with large varicosities of the esophagocardiac junction and a large, dilated coronary vein.

pressure from dilated subserosal veins as seen *en profile*. These marginal defects are not to be confused with the pseudo-lobulation caused by infolding of the mucosa resulting from incomplete distention of the fundus. Varices may produce contour changes simulating those due to a neoplasm and are always to be considered as a possible cause of contour distortions of the upper third of the stomach (Figs. 3–7).

The second roentgen finding relates to the appearance of the gastric mucosa in the cardia and fundus, which is readily demonstrated by utilizing the natural contrast afforded by the fundic air bubble. The usual mucosal pattern is altered by the pressure of large tortuous subserosal and submucosal veins. These produce circular, curvilinear, and crescentic arc-like areas of radiolucence sharply outlined by thread-like barium collections. The resulting mucosal relief structure has a distinctive pattern which has been aptly referred to as having a "bubble" (8) appearance (Figs. 8–10). A variety of the normal mucosal picture in the fundus is the so-called "cerebriform" type. The apparent gyrations of the mucosa bear a superficial resemblance to the changes produced by gastric varices. Close scrutiny, however, will reveal the distinctive character of the pattern in the latter condition.

Fig. 4. Roentgenogram from gastrointestinal series of a 53-year-old female with cirrhosis of the liver. The patient had hepatosplenomegaly and hematemesis on admission. Note lobulated filling defects in region of gastric cardia caused by large gastric varices.

Because of the distortion of the mucosal pattern, carcinoma, lymphosarcoma, and polypoid gastritis are the diagnoses most likely to be entertained, especially in the absence of demonstrable esophageal varices. Close inspection will reveal that in gastric varices the mucosal folds have a continuity and sharp margination which is lacking in the thickened, irregularly coarse folds of polypoid gastritis. Moreover, it would be unusual for a gastritis to be limited to the cardia or fundus of the stomach. In carcinoma or lymphosarcoma the rugae appear prominent, stiff, and dis-

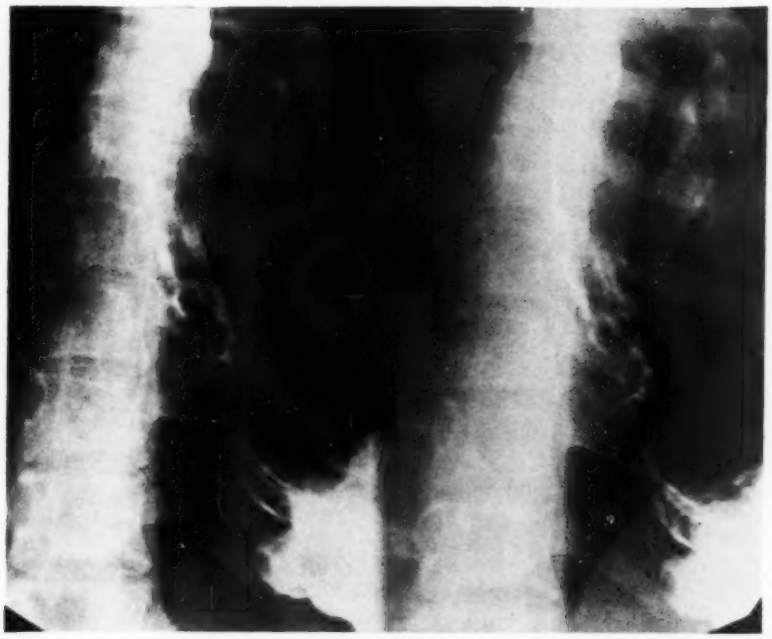


Fig. 5. Spot films of gastric cardia demonstrating lobulated radiolucent filling defects in region of esophagogastric junction. Moderate-sized varices are seen in the distal esophagus. The patient, a 16-year-old girl, was admitted to the hospital because of esophagogastric hemorrhage. At operation, a large granulomatous mass was found at the porta hepatis, occluding the portal vein. A hugely dilated coronary vein was identified and racemose varicosities of the gastric cardia and fundus were observed.

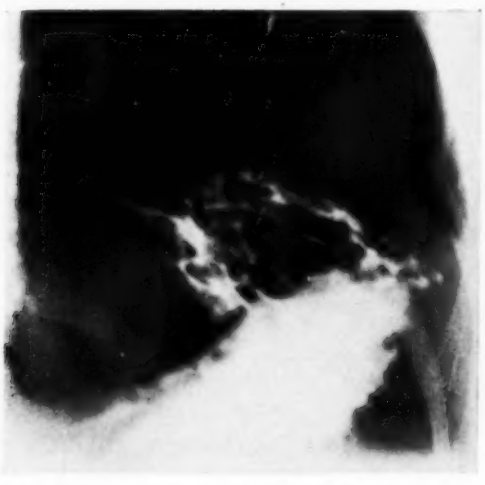
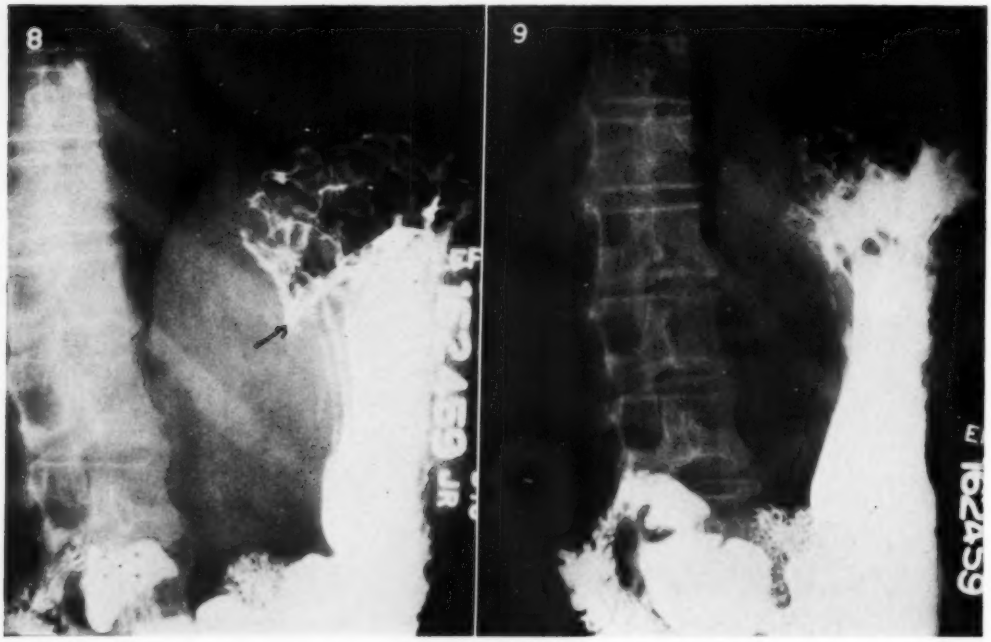


Fig. 6. Roentgenogram from gastrointestinal series of patient shown in Fig. 5, demonstrating the bubble-like appearance of the mucosa in the fundus of the stomach.

Fig. 7. Portal venogram of patient in Figs. 5 and 6, showing large dilated tortuous coronary vein, dilated right gastric and right and left gastroepiploic veins, and varicosities over fundus of stomach.



Figs. 8 and 9. Roentgenograms from gastrointestinal series of 50-year-old female admitted to the hospital because of a gastric ulcer high on the lesser curvature. There was a history of gastrointestinal hemorrhage eight months prior to admission. Examination revealed hepatomegaly and splenomegaly of undetermined etiology. Lymphosarcoma of the upper third of the stomach was considered a likely possibility. The esophagus on the gastrointestinal examination was considered normal and there was no evidence of esophageal varices. Fig. 8 reveals a small ulcer (arrow) high on the lesser curvature. The mucosal pattern of the upper third of the stomach in both figures has a polypoid appearance. There is present, however, what we consider the distinctive mucosal pattern seen in gastric varices, namely, the curvilinear, crescentic, arc-like radiolucencies sharply outlined by thread-like barium collections. Surgical exploration of this patient revealed "tremendous" varices of the gastric cardia; also varices involving the entire upper third of the stomach. These were the result of extraportal hypertension caused by a "golfball"-sized retroperitoneal "paraganglioma" obstructing the splenic vein.

organized, lacking the regularity and sharpness of varices. Since the cardiac and fundic portions of the stomach are inaccessible to the palpating hand, some idea of the pliability of this area may be obtained from noting the transmitted effect of respiration and cardiac pulsations. The presence of an enlarged liver or spleen may also be helpful in the differential diagnosis.

A demonstration of gastric varices requires no special technic, a barium-air contrast study of the upper third of the stomach is important. If sufficient air cannot be introduced into the stomach during the ingestion of barium, artificial means of increasing the air content may be advisable. Spot films taken in erect, supine, and prone position are an essential part of the examination. One of the most important points is to see that the mucosa of the fundus has been adequately bathed with barium in order to afford a good mucosal relief. In our experience, the Valsalva and Müller maneuvers have had no appreciable effect on the size of the varices.

In hypertension of the portal system, gastric varices are present more frequently than is commonly believed. When the diagnostic criteria outlined above were applied to the gastrointestinal roentgenograms of 40 cases of portal hypertension in which esophageal varices had been demonstrated, a definite roentgen diagnosis of gastric varices was made in 26 cases, while in 5 others the mucosal pattern was sufficiently suggestive to warrant a diagnosis of "probable gastric varices." The findings were limited to the region of the cardia in

10 cases, to the cardia and fundus in 19, and in 2 cases were identified only in the fundus. Further observations in 19 of the 31 cases, in the form of operative or postmortem findings, showed gastric varices in all. Such proof is still lacking in the remaining 12 patients, but to date the diagnosis has not been incorrectly applied. Four of the 5 probables are in this group.

In the presence of unexplained upper gastrointestinal bleeding, a search for gastric varices should be made. Identification of the gastric component of gastroesophageal varices, as well as awareness of the frequency with which it occurs in portal hypertension, has an important bearing on the selection of the proper surgical technic to control gastrointestinal hemorrhage in this condition. Local efforts such as exposure and ligation or injection of the esophageal veins not only fails to control the gastric varices but may increase their size and the possibility of bleeding from that source by partially obliterating an important shunt between the portal and caval systems.

CONCLUSIONS

1. In hypertension of the portal system, gastric varices occur more frequently than is generally recognized. Of 40 cases of portal hypertension with demonstrable esophageal varices, 16 showed definite roentgen evidence of gastric varices and highly suggestive evidence was obtained in 5 others.

2. Roentgenologically gastric varices caused filling defects in the contour of the cardia or fundus of the stomach and changes in the mucosal pattern in these same regions. The appearance of the mucosal pattern in the cases studied, while perhaps not in itself specific, nevertheless, has certain characteristics which are sufficiently suggestive to warrant a diagnosis.

3. Gastric varices should be included among the possible causes of filling defects of the cardia of the stomach.

4. Every case of portal hypertension should be carefully examined for gastric as well as esophageal varices, as the gastric component influences the selection of the surgical technic. No special procedures are necessary for the demonstration of gastric varices.

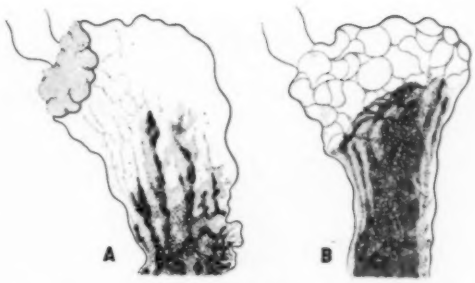


Fig. 10. A. Diagrammatic illustration of lobulated contour distortion of gastric cardia produced by gastric varices. B. Schematic representation of mucosal appearance for gastric varices.

ACKNOWLEDGMENT: The portal venograms illustrating this paper were made by Dr. Charles G. Childs, Department of Surgery, The New York Hospital, Cornell Medical Center.

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SUMARIO

Várices Gástricas

Las várices gástricas ocurren más frecuentemente de lo que se suele reconocer en asociación con hipertensión del sistema porta, y opina los AA. que deben buscarse en todo caso de hipertensión de la porta, pues afectarán la selección de la técnica quirúrgica.

En un estudio de 40 enfermos que se sabía tenían várices esofágicas, también se diagnosticaron várices gástricas radiográficamente en 26. Las várices gástricas dan dos importantes hallazgos roentgenológicos que, aunque no específicos, son suficientemente indicativos para justificar el diagnóstico. Son: (1) nichos lobulados lisos del cardias o del fondo, que reflejan la presión externa ejercida por las venas dilatadas; (2) alteración del patrón de la mucosa debida a la presión derivada de grandes y tortuosas venas subserosas y submucosas, que produce radiolucencias circulares, curvilíneas y semilunares a modo de arcos, netamente demarcadas por depósitos de bario, delgados y filiformes.

Benign Ulcer of the Greater Curvature of the Stomach[1]

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IT IS COMMON opinion that, whereas a gastric ulcer of the lesser curvature is more likely to be benign, ulcers of the greater curvature are virtually 100 per cent malignant.

The case to be reported here is one of benign ulcer of the greater curvature which on roentgen examination was thought to be a carcinoma. Few similar cases, with establishment of the correct diagnosis by histologic examination, have been recently reported in the literature. These exceptions to the general rule are of importance from a diagnostic point of view and assume even more significance when one considers the small number of all lesions primarily located along this segment of the gastric wall.

CASE REPORT

A 53-year-old white retired government employee was admitted to the hospital for chronic osteoarthritis of the lumbosacral spine on Jan. 27, 1950. He had been hospitalized in September 1947 because of dull epigastric pain following meals, first noted a few months previously. X-ray examination of the gastrointestinal tract showed a penetrating posterior wall duodenal ulcer. There was no fluoroscopic or roentgenologic evidence of any lesion of the stomach. The gastric analysis did not reveal changes of note; there was no hypersecretion or abnormal content of free hydrochloric acid. The patient was placed on an ulcer regime and in about one month the epigastric discomfort had subsided. Another gastrointestinal series (October 1947) showed a healing duodenal ulcer. The large crater in the posterior wall of the duodenal bulb present in the first examination was no longer visualized. At six hours the stomach was empty, the head of the barium column reaching the hepatic flexure. The peristaltic waves were normal in frequency and amplitude, and the outline of the bulb appeared normal on all the films.

The patient did not again complain of gastric disturbances until January 1950, when, during his stay in the hospital for evaluation of the arthritic condition, he experienced vague epigastric discomfort and burning following meals. Because of the previous duodenal lesion, this condition was investigated thoroughly. A gastrointestinal series on February 1 revealed a large pouch-like lesion on the greater curvature side of the gastric antrum. This pocket was tender and not freely movable on fluoroscopic examination (Fig. 1). It measured about 1.5 cm. in depth and 3 cm. across at its mouth. Gastric mucosal folds were seen running parallel to the pouch. A diagnosis of gastric carcinoma with ulceration was entertained. A repeat examination on February 6 confirmed essentially the previous findings. There was no evidence of decrease in size or change in contour of the ulcer. Gastroscopic examination on February 7 revealed large gastric folds on the greater curvature side of the pars media. This was particularly evident where the pars media

Fig. 1. Postero-anterior view, Feb. 1, 1950. Large ulcer pocket on the greater curvature side of the antrum. Note the parallel mucosal folds entering the pouch. The folds end before they reach the distal half of the ulcer pocket.

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[1] From the Departments of Roentgenology and Pathology, Veterans Administration Center, Bay Pines, Fla. Accepted for publication in February 1952.

Reviewed in the Veterans Administration and published with the approval of the Chief Medical Director. The statements and conclusions published by the authors are the results of their own study and do not necessarily reflect the opinion or policy of the Veterans Administration.

Fig. 2. Right oblique view, Feb. 9, 1950. Arrows point to the ulcer crater on the greater curvature of the antrum. No change in size of crater as compared with examination on Feb. 1.

meets the antrum. No ulcer, diverticulum, or any infiltrating process could be detected by the examining physician.

Laboratory studies revealed red and white blood cell counts within normal limits and good hemoglobin content (90 per cent), negative serology, normal liver profile, and persistent occult blood in the stools. Urinalysis was negative for sugar and albumin. A twelve-hour fractional night secretion study showed continued secretion of a normal amount of free hydrochloric acid (average values: free acid 37.0°, total acid 48.5°). Microscopic examination of the gastric contents showed the presence of amorphous debris and lymphocytes but no tumor cells.

Course in Hospital: Clinical improvement was obtained on an ulcer regime but, because of the patient's age and the location of the gastric lesion on the greater curvature, surgical intervention was considered, especially since no evidence of healing of the ulcer was shown in repeated x-ray studies (Fig. 2). On March 9 a subtotal gastrectomy with antecolic gastrojejunostomy of the modified Hofmeister-Polya type was performed under general anesthesia. At operation the ulcer was palpated on the greater curvature side of the pars media; the omentum was found adherent to the peritoneum covering the greater curvature. The liver and adjacent viscera were grossly unaltered. Frozen sections of the two regional lymph nodes showed no evidence of neoplastic involvement.

Description of the Specimen: The operative specimen consisted of the distal two-thirds of a surgically resected stomach which, when spread out on a flat surface, measured 16 cm. in length and 12 cm. in breadth. At the antral portion of the stomach and located exactly along the greater curvature, approximately 2 cm. from the pylorus, was a deep ulcer extending throughout the entire thickness of the gastric wall (Fig. 3). A portion of the greater omentum was adherent to the base of the lesion. The outer crater of the ulcer measured 3.5 cm. in diameter. The sides of the ulcer were steep; the base, apparently resting on tissues outside the gastric wall,

Fig. 3. Section through approximately the midportion of the excised ulcer specimen. Note the extension of the ulceration through the muscularis to reach the serosa.

was necrotic and partly covered by grayish exudate. For 2 cm. surrounding the ulcer the rugal folds were flattened and the mucosa was pale and edematous. The folds were prominent elsewhere along the greater curvature. The regional lymph nodes were soft, up to 2.5 in diameter, and pinkish-brown on the cut surface.

Microscopic Examination: Sections through the lesion revealed some heaping of the mucosal edges. The base of the ulcer was covered with a thin layer of fibrinous exudate resting upon the chronically inflamed granulation tissue (Fig. 4). The ulcer itself penetrated all the way through the true muscle coats, which were interrupted and presented extensive fibrosis in the areas directly surrounding the crater. Here and there a few collections of lymphocytes, eosinophils, and plasma cells were noted. Remarkable was the presence of large lymph follicles with poorly defined germinal centers in the fibrotic areas. The small arteries in the muscle coats of the adjacent portion of the gastric wall showed pronounced subintimal hyperplasia. The serosa was fibrosed. No evidence of gastritis was demonstrable in the multiple sections of the stomach along the proximal line of resection or at the pylorus. Section of the duodenal stump revealed flattened mucosa and
muscle coats. Sections of three lymph nodes sho...
moderate follicular hyperplasia.

Final Pathological Diagnosis: Peptic ulcer, chronic, deep, greater curvature of the stomach.

The immediate *postoperative course* was uneventful. The patient was last seen nineteen months after operation. At that time he was in good general condition without subjective complaints. Examination of the gastrointestinal tract did not reveal any findings of note.

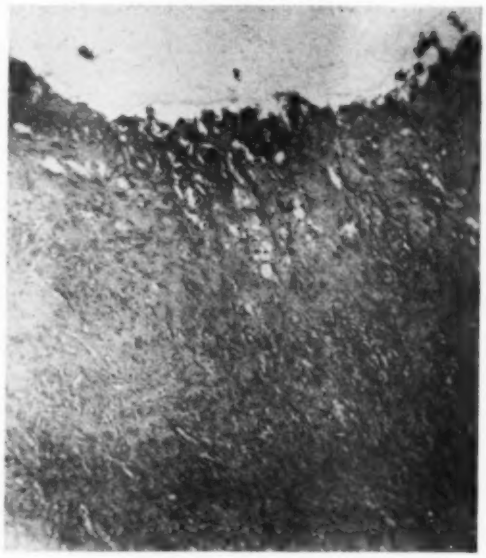

Fig. 4. Base of peptic ulcer. Fibrinopurulent exudate resting on chronically inflamed granulation tissue. Hematoxylin and eosin. ×100.

COMMENT

Rigid clinical criteria to differentiate simple ulcers from gastric cancer have not yet been established, and no informative data can be obtained from the analysis of the reports of the few known cases of benign greater curvature ulcer (1). In our case the subjective symptoms were not characteristic, though the history of a previous duodenal ulcer could have shifted diagnostic opinion toward the presence of another benign lesion and the laboratory findings might have supported such a contention. On the other hand, the x-ray appearance and especially the location of the lesion overshadowed any other differential consideration, and the clinical diagnosis of a malignant lesion was made. If the location of the ulcer is therefore considered the most significant diagnostic guide in such cases, it is not useless to try to evaluate in its proper light the generally accepted law which considers each ulcer of the greater curvature a malignant one.

Review of the literature indicates that a definite group of cases of benign ulcer of the greater curvature can be accepted on the basis of the criteria set forth by Sproull (2). According to this author only 10 cases culled up to 1931 presented enough histologic evidence to substantiate the diagnosis of a benign ulcer in such location. Levin (3) in 1949, on the basis of the analysis of all previous records, accepted only 21 cases, and Friedman (4) one year afterward brought the total figure to 26. Four more recent observations (5, 6, 11, 13) can be added, our own being the 31st so far recorded.

Do these cases express the true incidence [illegible]stric ulcer of the greater curv[illegible]. Obviously these figures do not constitute the entire series, since at least 15 more cases were mentioned in the Panel Discussion on the relationship of gastric ulcer and carcinoma presented before the J. Ewing Society in 1949 (7). One should also take into consideration the autopsy findings which have been reported from time to time during the last twenty-five years (8, 9). The usefulness of this material may be questioned because of the known occurrence of acute upper gastrointestinal ulcerations *sub finem vitae;* on the other hand, it may be difficult to evaluate these data correctly, because we know that marked discrepancy exists between necropsy and clinical studies in respect to (*a*) ratio of duodenal to gastric ulcers and (*b*) incidence of benign lesions in rare locations. The fact still remains, as demonstrated by the careful work of Boudreau and his colleagues (10), that benign ulcers of the greater curvature are present in somewhat higher percentage than is usually surmised.[2]

In addition, cases have been reported of

[2] Twenty-four benign ulcers of the greater curvature were found among 168 benign gastric lesions in patients above fifty years of age autopsied at the Mallory Institute of Pathology from 1940 to 1949.

benign ulcer of the greater curvature as shown by x-rays with healing noted clinically and roentgenographically. Some of the cases reviewed were probably benign (5, 6, 12), but they cannot be included, because their exact location and their benign nature were not proved beyond doubt. It is not possible to determine exactly the actual incidence of simple ulcers of the greater curvature, but the combined analysis of the necropsy and surgical data would modify some prevalent clinical concepts in regard to the generally accepted exceptional occurrence of benign lesions along this gastric segment.

The location of an ulcer on the greater curvature still constitutes an important element for a dependable diagnosis of cancer, but it must not be considered an absolute criterion and must be evaluated in the light of all other clinical and laboratory findings.

SUMMARY

A case of deep peptic ulcer located on the greater curvature of the stomach is presented.

The problem of the true incidence of benign lesions in this location is discussed on the basis of the surgical and necropsy data reported in the literature.

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SUMARIO

Úlcera Benigna de la Curvatura Mayor del Estómago

Preséntase un caso de úlcera benigna de la curvatura mayor del estómago, que parecía maligna al examinarla roentgenológicamente. Se operó, y el examen microscópico condujo al diagnóstico de úlcera péptica crónica.

Este el trigésimo-primer caso que se haya comunicado de úlcera benigna de la curvatura mayor del estómago, pero esa cifra no parece representarla la verdadera incidencia.

Aunque la localización de una úlcera en la curvatura mayor todavía constituye un elemento importante en el diagnóstico certero de malignidad no debe considerarse como pauta absoluta, sino que debe justipreciarse a la luz de todos los demás hallazgos clínicos y de laboratorio.

Lesser Sac Hernia via the Foramen of Winslow

A Case Report[1]

CHRISTIAN V. CIMMINO, M.D.

THE PURPOSE OF this report is twofold: (1) to make lesser sac hernias better known among radiologists; (2) to indicate how an early rational diagnosis of this condition can be made from the plain films, thereby lowering the excessive operative mortality of more than 60 per cent.

Lesser sac hernias are rare. According to Lavarde and Chevret in 1949 (5), less than 70 cases had been reported in the world literature, and only 5 cases in which consideration was given to the radiologic aspects. We are aware of no case reports since then.

A detailed description of the lesser sac need not be given here, since it is readily available elsewhere. Suffice it to say that it is a potential space bounded anteriorly by the caudate lobe of the liver, the lesser omentum, the stomach, and the anterior two layers of the greater omentum; posteriorly, by the two posterior layers of the greater omentum, the transverse colon and its mesentery, portions of the pancreas, left adrenal gland, and kidney. On the right side is the foramen of Winslow, and on the left are the spleen and the phrenicolienal and gastrolienal ligaments.

Portions of the gut can enter the sac through either the foramen of Winslow or a rent (congenital or traumatic) in the transverse mesocolon. In the latter case, bowel might either be completely contained within the sac or emerge from the foramen, or even emerge *via* another rent in the lesser omentum. The segment of gut herniated varies from case to case. The hepatic flexure of the colon was involved in the case of Bosch and Schinz (5); the entire right half of the colon in the case of Hollenberg (3); the lower ileum in the case of Lavarde and Chevret (5); the upper ileum in our case.

The mechanism of herniation through a rent in the transverse colon needs no comment. But what are the factors predisposing to herniation *via* the foramen of Winslow? The most important is probably some abnormality in the mesentery, such as poor fixation of the right half of the colon or an abnormally long mesentery of the small intestine. Other factors are an excessively large foramen of Winslow, increased intra-abdominal tension as in repeated pregnancies, a low-projecting right lobe of the liver with concave inner aspect and a resultant tendency of the gut to be funneled cephalad. This latter factor might be enhanced by adhesions between gallbladder and transverse colon. In some cases, such as ours, no predisposing factor was apparent.

DIAGNOSIS

Several roentgenologic signs have been suggested in the past for the diagnosis of lesser sac hernias. Case and Upson (1) believed that demonstration of small bowel anterior to the hepatic flexure or first part of the transverse colon was necessary to establish the diagnosis. This would obtain when the herniated segment consisted of small intestine, but not when the hernia involved the colon exclusively, nor when the hernia entered the lesser sac through the transverse mesocolon. Hollenberg (3), making what he believed was the first preoperative roentgen diagnosis of lesser sac hernia, stressed the importance of gas in the lesser sac associated with obstruction in the transverse colon as revealed by barium enema. Operation fully confirmed his prediction of lesser sac hernia *via* the foramen of Winslow, involving the right side of the colon. According to Lavarde and Chevret, blockage of the transverse colon, when associated with clinical and roentgenologic evidence of obstruction high in the intestinal tract, is practically pathognomonic of the condition. They point

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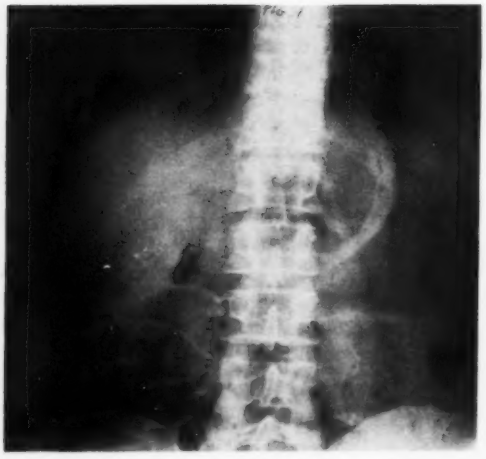

Fig. 1. Supine anteroposterior view. Note the accumulation of gas just medial to the lesser curvature of the stomach and the extrinsic pressure defect upon the lesser curvature; also the fine crescentic shadow of lesser density between the large accumulation of gas in the lesser sac and the gas in the stomach, defining the wall of herniated intestine.

out that the roentgenologic appearance of the colonic obstruction is not that of tumor or invagination, but of spiraling or compression. This defect is caused by a bend or a twist in the colon incident to its herniating into the lesser sac, or by pressure upon the colon as it is crossed by the small intestine on its way to the sac.

CASE REPORT

A 47-year-old white male was admitted to the hospital with a twelve-hour history of upper abdominal pain, followed by vomiting. He had been well up to that time. Physical examination showed an ill-appearing man, with normal vital signs. His abdomen was diffusely tender, but no muscle spasm was elicited. The white blood cell count was 13,450, with a shift to the left. The urine contained sugar (3+), and a blood sugar determination revealed 289 mg. per cent. (Incidentally, this returned to normal postoperatively.) Immediate operation was undertaken, largely on the basis of the findings of the X-ray Department. Operation disclosed about five loops of dark, distended upper ileum herniated into the lesser sac *via* the foramen of Winslow. Reduction was accomplished with no great difficulty, and the postoperative course was uneventful.

COMMENT

The supine, upright sagittal and lateral views of the abdomen, without the aid of barium, were used to arrive at the diagnosis. We were at once impressed with the gas and fluid levels in the lesser sac. In a previous paper (2) we discussed gas and fluid in the lesser sac as a sign—at times, the only sign—of perforated duodenal ulcer. A diagnosis of "gas and fluid in the

Fig. 2. Upright anteroposterior view. At least three fluid levels are visualized in the region of the lesser sac. The gastric bubble is faintly visualized under the dome of the left hemidiaphragm.

lesser sac" in this present case was given, and in view of our recent experience we thought that perforated ulcer should be strongly considered. Dr. John L. Smoot, the attending surgeon, suggested lesser sac hernia as an explanation for the gas and fluid. Surgery proved the correctness of his suggestion. We later compared the roentgenologic studies in this case with the findings noted in those patients with free gas and fluid in the lesser sac from perforated ulcer, and differences were at once apparent. The fluid levels in the present patient were smaller, and multiple, and did not conform to the anatomic recesses of the lesser sac, such as the superior omental and the lienal. And, most important, the actual wall of a loop of gut in the lesser sac was brought into relief on one side by the intraluminal gas and on the

other by a narrow dark stripe explained either by gas in another loop or by fat. Hence, we believe that the *specific* diagnosis of gas and fluid in loops of gut (lesser sac hernia with obstruction) might well have been made, rather than the *generic*, but nonetheless correct, diagnosis of gas and fluid in the lesser sac. In either event, immediate surgery in this case was mandatory.

Fig. 3. Upright left lateral view. Again, several fluid levels are visualized in the region of the lesser sac. In view of Fig. 2, it is unlikely that any of these fluid levels is gastric.

SUMMARY

1. The diagnosis of lesser sac hernia is possible by means of plain supine, upright sagittal and lateral roentgenograms of the abdomen.

2. Early diagnosis will result in early surgical relief, and, it is hoped, lowered operative mortality.

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SUMARIO

Hernia de Saco Menor por el Agujero de Winslow. Observación

El caso aquí presentado de hernia del saco menor por el agujero de Winslow fué operado con éxito en gran parte a base de los hallazgos roentgenológicos, sin ayuda del bario.

Los niveles de gas y de líquido observados radiográficamente en el saco menor fueron considerados debidos a úlcera perforada o posiblemente hernia del saco menor. La operación reveló unas cinco asas obscuras y distendidas de la porción superior del ileon, herniadas al saco menor por el hiato de Winslow. Un estudio subsiguiente de la radiografía demostró que los niveles de líquido eran menores que los que caracterizan a las úlceras perforadas, eran además múltiples y no se conformaban a los recodos anatómicos del saco menor. Además, la pared de un asa intestinal fué puesta de relieve en un lado por el gas intraluminal y en el otro por una franja estrecha y obscura imputable ya al gas contenido en otra asa o a tejido adiposo.

Radiologic Demonstration of an Invaginated Intussuscepted Meckel's Diverticulum[1]

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MECKEL'S DIVERTICULUM is a common anomaly of the small intestine, occurring in about 2 per cent of the population (10), but its radiographic demonstration is rare (1, 4). It may be complicated by ulceration with hemorrhage or perforation, by inflammation, by obstruction as a result of adhesions, by intussusception, or by tumor arising within the diverticulum.

Invagination of Meckel's diverticulum with resulting intussusception, though uncommon, is not an extreme rarity (2, 3, 5, 6, 7, 8, 11, 12). In 2.5 to 5.0 per cent of cases of intussusception (6, 7), the mechanical cause is a Meckel's diverticulum.

The following case is deemed worthy of record because of the radiographic demonstration of an ileo-ileal intussuception produced by the invagination of a Meckel's diverticulum. No similar radiographic demonstration has been found in the literature.

CASE REPORT

F. D. F., a 31-year-old white male, was admitted to Lawson VA Hospital, May 22, 1951. He had been well until two weeks before admission, when severe constipation developed, for which he took laxatives. Following this he experienced colicky periumbilical pain, with no nausea or vomiting. Horizontal and upright radiographs of the abdomen at that time were normal. About the same time catharsis occurred, and the pain was relieved. Mild intermittent colicky attacks continued, however, until three days before admission, when watery diarrhea occurred. The day before admission the patient began having moderately severe periumbilical pain associated with melena. In addition to containing moderate amounts of bright red blood, the stools appeared tarry. Weakness and anorexia occurred, but no vomiting.

There was a history of acute appendicitis and an appendectomy four years earlier. The only notable findings on physical examination were pallor of the skin, a soft, flat abdomen with slight tenderness in both lower quadrants, absence of rebound tenderness, hyperactive peristalsis, a questionable mass in the lower quadrant. Rectal examination revealed no tenderness or masses; fresh blood was present in the anal canal. The hemoglobin was 7.9 gm., hematocrit reading 25 mm., the white blood cell count 16,700, with a normal differential count. The stools showed 4 plus occult blood.

Roentgenographic Studies: Routine roentgenograms of the chest and abdomen were within normal limits. A barium enema study was done on the second hospital day (May 23, 1951) and revealed no abnormality. Following this, an upper gastrointestinal barium study was done but nothing of significance was found. A three-hour progress film of the abdomen, however, revealed an area in the distal ileum strongly suggestive of an intrinsic filling defect (Fig. 1A).

On the night of May 23, 1951, a Harris tube was passed into the small intestine and the following afternoon a small intestinal barium clysis was done. Fluoroscopically, nothing abnormal was found in the proximal small bowel. In the ileum distally there was noted a point at which the passage of barium was temporarily delayed. As filling finally occurred, there appeared to be extrinsic pressure on the bowel in the following 12 inches. At the termination of this segment was an intraluminal filling defect. Barium then entered the cecum without obstruction, after passing through a long segment of apparently normal ileum (Fig. 1B, C, D). A twenty-four-hour film of the abdomen revealed all barium to be in the colon.

It was the radiologic opinion that the patient had an intraluminal tumor in the distal ileum, probably lymphoma. Two of the surgical residents recorded the possibility of intussuscepted Meckel's diverticulum on the basis of the clinical findings.

Hospital Course: The patient was given several transfusions and was prepared for surgery, with a presumptive diagnosis of small bowel tumor, possibly lymphoma.

On May 29, 1951, under continuous spinal anesthesia, the abdomen was opened through a transverse incision 2 cm. below the umbilicus. Near the cecum, at a distance of 3 feet from the ileocecal valve, a firm elongated mass involving the bowel

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Fig. 1. A. Anteroposterior roentgenogram of abdomen three hours after barium meal. There is a filling defect within the distal ileum (arrows) suggestive of an intraluminal tumor mass.

B. Spot film of ileum taken during administration of a small intestinal barium clysis. It demonstrates the radiolucency of the intussusceptum (B), surrounding which is the intussuscipiens (C). There is an "appendiceal-like" filling defect at the head of the intussusception which probably represents the invaginated Meckel's diverticulum found at surgery.

C. Anteroposterior roentgenogram of the abdomen after small intestinal barium clysis demonstrating the origin of the intussusception (A), small streaks of barium in the lumen of the intussusceptum (B), the lucency produced by the intussusceptum (C), the head of the intussusception (D), and the intussuscipiens (E).

D. Drawing of C.

Fig. 2. Ileo-ileal intussusception produced by invaginated Meckel's diverticulum as seen at surgery after the ileum was delivered into the operative wound. The hemostat marks the origin of the intussusception.

wall was palpated and delivered into the wound. The mass measured 10 inches in length and on inspection was found to be an ileo-ileal intussusception. A photograph was made of the exteriorized lesion (Fig. 2). The intussusception could be reduced only partially. A Meckel's diverticulum was found invaginated into the central portion of the mass. This 12-inch segment of the ileum was resected and an end-to-end anastomosis was performed.

Surgical Pathology: The specimen consisted of 22 cm. of ileum. Three centimeters from one end of the specimen a prominent outpouching was seen oriented at right angles to the long axis of the intestine. This structure measured 7.5 cm. in length and 3.5 cm. in circumference. In the apex of the pouch was a large irregular mucosal ulceration.

Microscopically, no gastric mucosa could be demonstrated. The ulceration extended into the muscularis.

Pathological Diagnosis: Meckel's diverticulum with chronic ulcer of diverticulum and intussusception into ileum.

DISCUSSION

The earliest known example of intussusception due to invaginated Meckel's diverticulum is the specimen placed in the St. Bartholomew's Hospital Anatomical Museum in 1846. Harkins' extensive review of the literature (7) in 1933 produced 160 reported cases. Paul, in 1939 (12), noted 16 additional cases. Gross and Ware (6) found 29 other examples in a series of 610 intussusceptions. The total number of cases has not been determined accurately but probably exceeds 250.

Meckel's diverticulum (2, 9) occurs in the distal ileum, 18 to 36 inches from the ileocecal valve. It is a blind outpouching of variable size, situated on the antimesenteric border of the ileum. This structure results from the failure of the omphalomesenteric duct to close in fetal development. The omphalomesenteric duct connects the fetal intestine with the yolk sac. Harkins estimates that of the complications arising from Meckel's diverticulum, intussusception comprises 17 per cent (7). This occurs more often before puberty. Greenfield and Smoak (5) have estimated that at least 80 cases have been reported after the age of puberty.

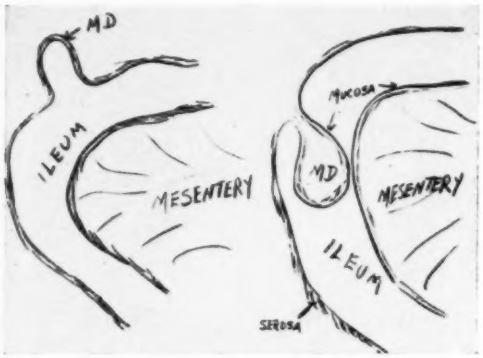

Fig. 3. Diagram illustrating the process of invagination of a Meckel's diverticulum.

Pathologically, the invaginated Meckel's diverticulum acts as a polypoid intraluminal mass which, when propelled along the intestinal lumen, results in an intussusception (Fig. 3).

Clinically, this lesion may produce an acute complete intestinal obstruction, or the course of the disease may be subacute or chronic, with recurring attacks of partial obstruction. In the case reported herein, the patient had symptoms about three weeks before operation was performed and the obstruction was not complete. Harkins concluded that intussusception due to Meckel's diverticulum produces certain distinguishing features which are not as

frequently found in other types of intussusception. It occurs in older individuals; a history of previous attacks is more frequent; the course is more chronic, often with a mild attack a day or two before the onset of the major illness (as in the author's case); if a mass is palpable, it is more apt to be on the right side; a mass is palpable per rectum in a much smaller proportion of cases; bleeding from the rectum is less profuse (melena was prominent in the author's case), this being because of associated ulceration.

Roentgenographic Findings: The actual demonstration of an intussusception of Meckel's diverticulum by an opaque medium is extremely rare, since in most cases surgical intervention is imperative and delay for extensive diagnostic radiographic studies is unwise. Routine films of the abdomen may reveal the usual signs of partial or complete intestinal obstruction. These studies were not helpful in the author's case, as obstruction was not present. Barium enema studies would reveal an ileocolic intussusception if present, but if intussusception is ileo-ileal, as is frequently the case with Meckel's diverticulum, findings may be negative, as in the present instance. A similar case demonstrated by small intestinal barium clysis has not been encountered in medical literature.

Accurate interpretation of the findings on small bowel clysis was not made preoperatively. Review of the films and correlation with operative findings, however, revealed that the exact anatomic relationship of the various structures was present radiographically. Figure 1 reveals the site of origin of the intussusception, the thin stream of barium in the intussusceptum, and perpendicular to this the folds of the widened loop of the intussuscipiens. Figure 1B demonstrates the head of the intussusception as a filling defect having an "appendiceal" appearance, probably representing the invaginated Meckel's diverticulum.

SUMMARY

A case of an invaginated Meckel's diverticulum is presented which resulted in an ileo-ileal intussusception which was demonstrated by a small intestinal barium clysis. This is an uncommon, though not rare, complication of Meckel's diverticulum.

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SUMARIO

Descubrimiento Radiológico de un Divertículo de Meckel Invaginado

Preséntase un caso de invaginación de un divertículo de Meckel, que dió por resultado intususcepción ileocecal que se descubrió con un enema en el intestino delgado. Trátase de una complicación poco frecuente del divertículo de Meckel.

Radiographic Features of Ureterocele[1]

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URETEROCELE, from the Greek (οὐρητήρ and κήλη), literally means hernia of the ureter. It is the result of a congenital stenosis of the ureteral orifice and a concomitant weakness of the wall of the lower ureter so that there is a resultant ballooning of the terminal ureter into the bladder. When this latter anomaly is present, the ureterocele usually affects the ureter draining the upper kidney. Ureteroceles may also contain calculi.

The sex incidence of ureterocele is not proved, though some observers report a greater incidence in females. There is

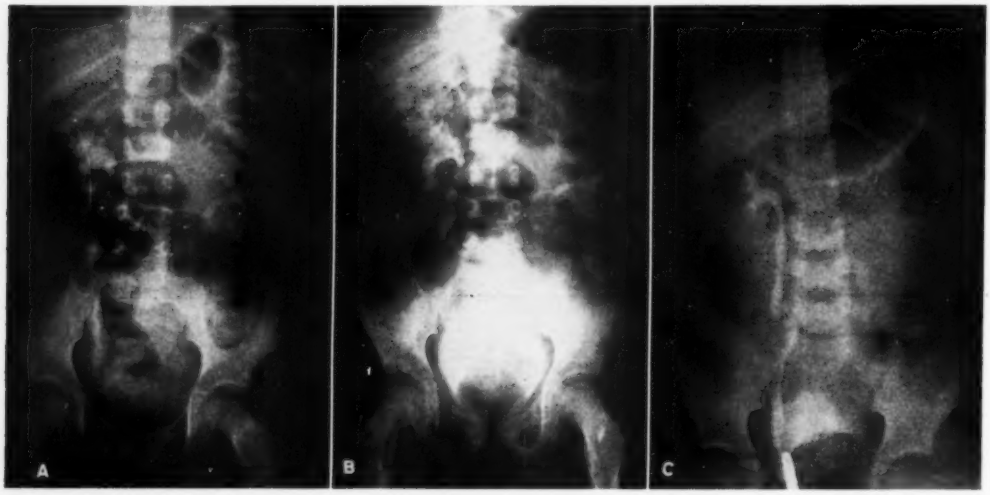

Fig. 1A and B. Intravenous urograms on a five-year-old girl obtained at fifteen and thirty minutes, respectively, showing filling defect on the left at the base of the bladder. The operative findings were left ureterocele and other congenital anomalies, including double renal pelves and ureters on the left.
C. Retrograde urogram of the same case, showing the characteristic filling defect at the bladder base. There is slight right-sided ureterectasis.

This intracystic ballooning of the dilated ureter produces a characteristic defect on the cystogram, which is practically pathognomonic in the infant. The extent of the radiographic defect is proportional to the size of the ureterocele, which may vary from a centimeter in diameter to sizes which fill the bladder and may occasionally, in the female, prolapse through the urethra.

Because of obstruction secondary to the ureterocele there is frequently an associated hydronephrosis on the affected side. Of the anomalies concomitant with ureterocele, double ureter is the most common. no predilection as to location on the right or left side.

Radiographically ureterocele appears as a round, constant filling defect at the ureteral orifice. On occasion, with intravenous urography, the thickness of the ureterocele wall will form a non-opaque halo or cobra head, with contrast substance in the ureter, ureterocele, and bladder. When stones are present they lie within this halo.

In the practice of the pediatric urologist ureterocele is not rare (Campbell reports 1 in 30 cases of chronic pyelitis) but in a general x-ray department the lesion is not often seen.

[1] Accepted for publication in February 1952.

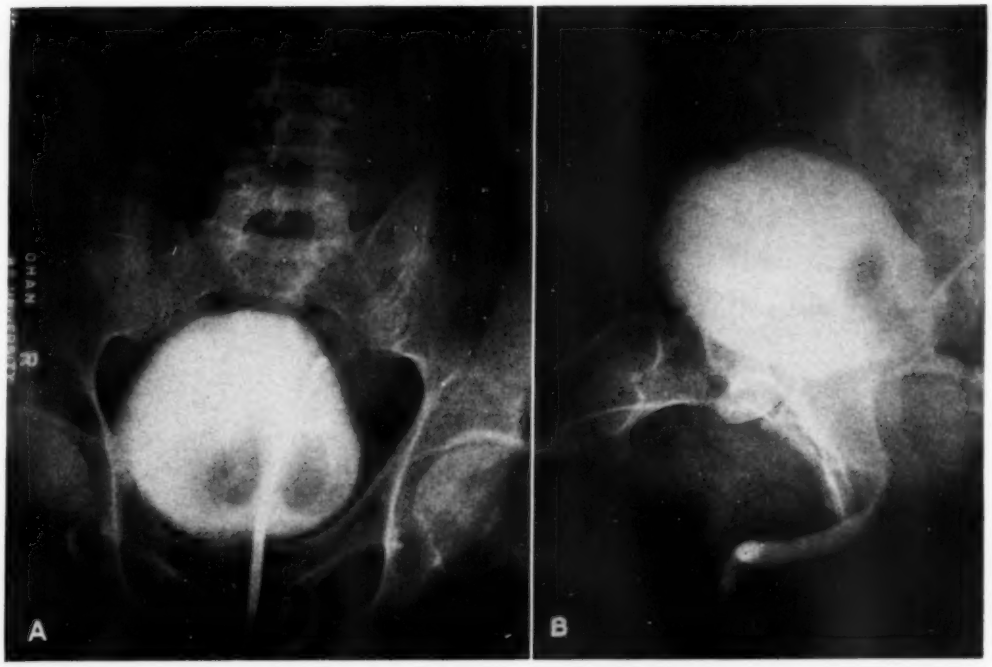

Fig. 2. Anteroposterior (A) and oblique (B) cystograms showing bilateral filling defects ascribable to ureteroceles, proved at operation.

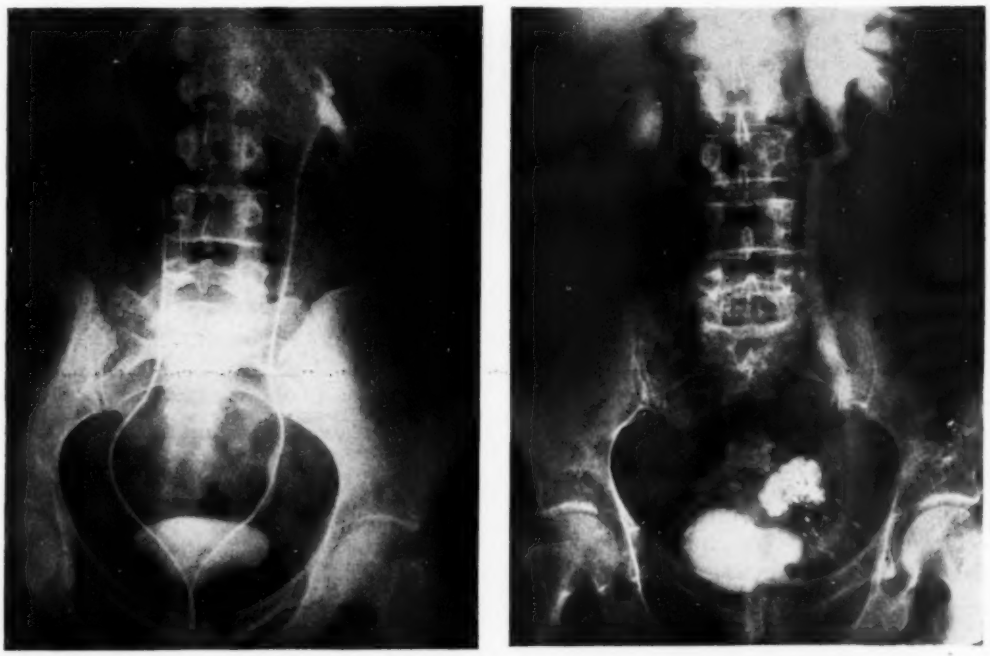

Fig. 3 (left). Retrograde examination showing typical "cobra head" deformity.
Fig. 4 (right). Ureterocele on the left, with filling defect and double density at the ureterovesical junction; associated hydronephrosis and hydroureter on the same side. Note hemangioma of L-5, calcified fibroid, and intragluteal heavy metal.

Fig. 5. Case in a two-year-old boy.
A. Catheter coiled within ureterocele on the right. B. Bilateral retrograde examination demonstrating marked hydronephrosis and hydroueter bilaterally.
At operation a double ureter was found on the right, with right ureterocele, hydronephrosis, and hydroureter.

Ureterocele should be suspected when the radiographic signs described above are present. Once the condition is suspected, it is in the province of the urologist to make the final diagnosis and to prescribe treatment.

There are no cardinal signs or symptoms of ureterocele other than complaints referable to the genitourinary tract. Dysuria is most commonly the chief complaint on the part of the younger patients. In the adult the symptoms are those due to the secondary hydronephrosis.

We present five proved cases of ureterocele demonstrating the typical radiographic findings. These findings are sufficiently pathognomonic that the diagnosis can be readily made by intravenous urography, especially in the infant, without the aid of cystoscopy or retrograde pyelography.

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SUMARIO

Características Radiográficas del Ureterocele

El ureterocele es el resultado de una estrechez congénita del orificio ureteral y de una debilidad concomitante de la pared de la porción inferior del uréter, de modo que ocurre una distensión de la porción terminal del uréter a la vejiga. El cuadro radiográfico es de un nicho constante y redondo en el orificio ureteral. En el urograma intravenoso, el espesor de la pared del ureterocele puede tomar la forma de una corona o "cabeza de cobra" no opaca, con substancia de contraste en el uréter. Frecuentemente hay una hidronefrosis concomitante en el lado afectado, y puede haber otras anomalías, y en particular uréter doble.

Los hallazgos descritos son suficientemente diacriticos para permitir hacer el diagnóstico por la urografía endovenosa, sobre todo en las criaturas, sin utilizar ni la cistoscopia ni la urografía retrógrada.

Preséntanse 5 casos con grabados.

Carcinoma of the Breast

Roentgenographic Technic and Diagnostic Criteria[1]

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THE APPROACH to the diagnosis of cancer of the breast usually has omitted the x-ray examination (1, 2). This may have been justified on the basis of the inconclusive results previously reported by numerous investigators in this field, (7, 19, 20, 24, 25, 27, 29). Now, however, with improved x-ray technics (13, 14), adequately checked against pathological findings (15, 23), a reconsideration of the x-ray examination as a routine procedure in the diagnosis of early mammary carcinoma is warranted.

TECHNIC

A lateral and a tangential view of each breast, either in the erect or recumbent position, probably are adequate for survey purposes (4, 6, 11), but an additional "spot film" with a small cone in either the lateral or tangential direction is required for the examination of the diseased breast (16). The application of a small lead shot to the skin over the lesion, with scotch tape, helps the radiologist select the proper area for particular scrutiny.

Non-screen films are used. Type A industrial fine-grain films are slightly superior but require more critical control of exposure factors. The breast is lightly compressed between the cone and the film. A fine-focus tube is used and the film-target distance varies. The optimum factors for an adult fatty breast are: 30 to 32 kv. and 200 to 400 ma.; for a dense compact breast free of fat, the kilovoltage is raised to 36 to 38, the other factors remaining constant.

The obvious advantages of this technic, based on that used by Leborgne (15, 16) are demonstrated in Figures 1, 2, and 3.

For the lateral views of the breast, a special cone is used. One sector is cut out so that, when the cone is in place, the cut-out sector allows compression of the breast between the film and cone without interference by the chest wall (Fig. 7). Shorter cones with smaller apertures are used for the spot-film technic. If the film can be brought close to the lesion in the breast, a film-target distance of 30 cm. is chosen; if the lesion cannot be placed close to the film, then a film-target distance of 75 cm. is used. Changes in film-target distance, necessitated by the apparatus and the thickness of the breast, must be compensated by appropriate changes in the milliamperage. The factors suggested for spot-film exposures are: 30 kv. and 25 ma. for each centimeter of tissue at 30 cm. film-target distance. Compression of the tumor-bearing portion of the breast can be effected by using a thin plastic sheet between the cone and the breast. If the tumor lies against the chest wall, gentle traction on the nipple will sometimes bring it forward into position for a good spot-film exposure.

DIAGNOSIS

Primary Signs

1. Comparative Clinical and Radiological Size of Tumor: Leborgne (16) has pointed out that if the measurements of a palpable tumor exceed the measurements of the tumor shown on the x-ray film, the tumor is malignant. He regards this as the most important single sign in the diagnosis of malignancy. We have tested this and found it surprisingly true. For example, the tumor illustrated in Figure 3 measures

[1] From the Albert Einstein Medical Center, Northern Division, Philadelphia, Penna. The expenses of these studies were partly defrayed by a grant from the American Cancer Society.
This report is dedicated to Dr. George E. Pfahler, whose pioneer efforts and continued interest have deeply influenced our work on this subject.

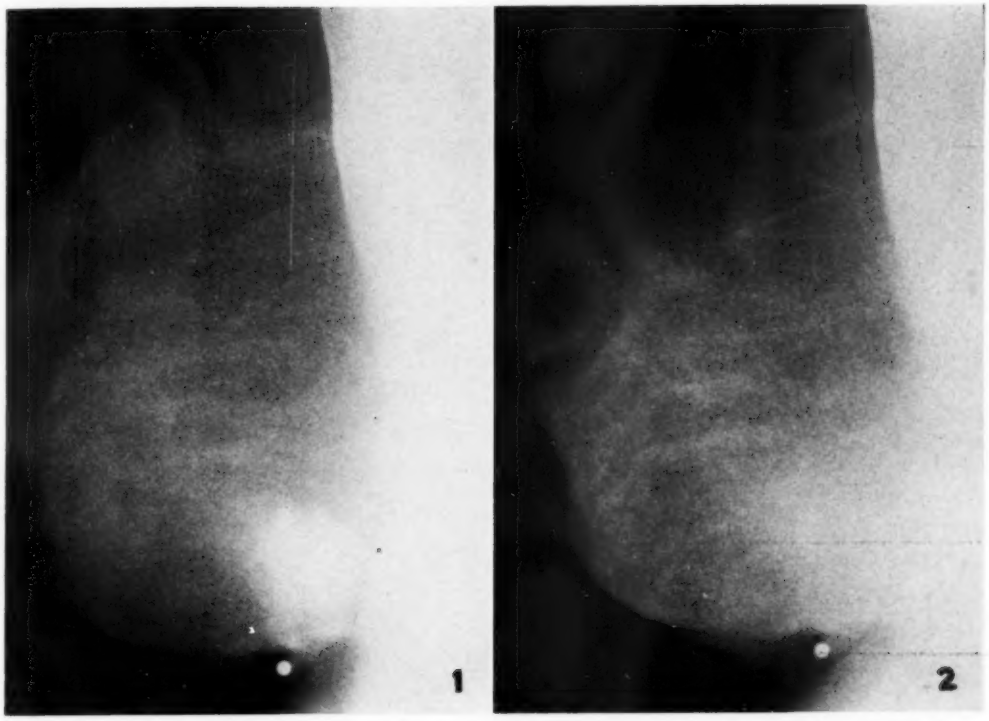

Fig. 1. A lateral view of the breast made with our original technic, showing a malignant tumor near lower border. The marker on the skin is close to the tumor. The exposure factors were: 50 kv., 100 ma., $^1/_{10}$ second, 75 cm. film-target distance, Par Speed Patterson screens, Eastman x-ray film, and a fine-focus rotating anode (1 mm.) Machlett tube.

Fig. 2. Another lateral view of the breast shown in Fig. 1 made with improved technical factors giving an increased contrast. The exposure factors were: 50 kv., 100 ma., $^1/_2$ second, 75 cm. film-target distance; Patterson Par Speed screens, Eastman fine-grain x-ray film, a Lysholm grid, and a fine-focus rotating anode (1 mm.) Machlett tube.

3 cm. on the film; clinically the diameter was 6 cm.

2. Radiopacity of Tumor: Visibility depends on the difference in density between the tumor and the surrounding tissue. There is, as a rule, some absolute increase in the density of the tumor mass, due in part to the tumor cells being richer in minerals than their normal counterparts (28, 30) and in part to hemorrhage and necrosis within the growth. Hemosiderin is derived from the effused blood, and minute calcium deposits may be found in necrotic material. These have been described by Leborgne (16), who has observed calcium deposits in about 30 per cent of his cases. To be of diagnostic value, Leborgne claims that the film must show "uncountable minute flecks of calcium which are unencapsulated. They occur chiefly in comedo and duct carcinoma (*i.e.*, a carcinoma spreading chiefly in the lumen of the ducts). These punctate deposits may be seen in duct carcinoma when no tumor can be felt" (Fig. 9). Deposits of calcium in degenerated fibroadenoma or old traumatic lesions are fewer and easily counted, larger and sometimes bizarre in outline. Minute particles, if few in number, are not diagnostic; they may be phleboliths or arterial calcifications (17, 18).

Although there may be actual increased density of the mass, visibility is dependent mainly on the nature of the surrounding tissue. For this reason, size makes little or no difference in visibility. A large, clinically obvious tumor may be harder

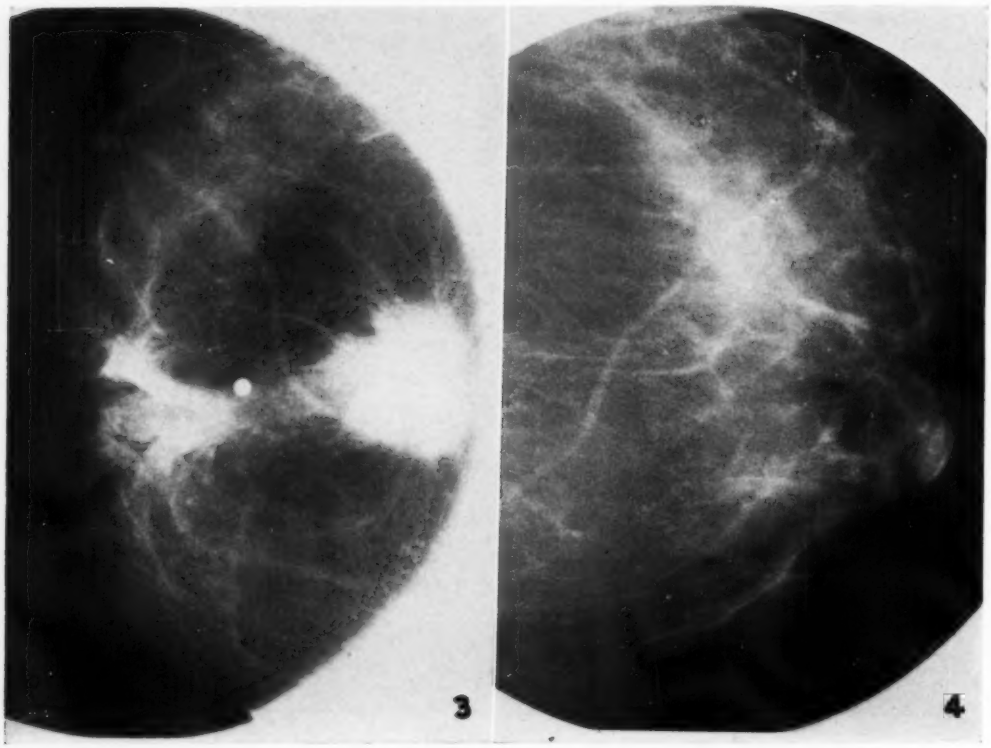

Fig. 3. A caudad view of the breast shown in Figs. 1 and 2, made with our latest technical factors. The improved diagnostic qualities of this film are obvious. The exposure factors were: 30 kv., 100 ma., 2 seconds, 40 cm. film-target distance, Ansco non-screen film, a fine-focus rotating anode (1 mm.) Machlett tube. The breast tissue was gently compressed between the cone and film by a thin plastic sheet over the aperture of the cone.

All the x-ray criteria of malignancy are clearly visible, *i.e.*, the diameter of the tumor measures 3.0 cm., whereas by palpation it measured approximately 6 cm.; the density of the tumor is increased absolutely and relatively over the other breast components; the tumor margins are spiculated and radiate in all directions; the tumor bed structures are less distinct than the more peripheral tissues; the trabeculae around the tumor are prominent, especially those leading from the nipple; the overlying skin is thick; the nipple is retracted and there is increased prominence of the vascular pattern. Compare with Fig. 4, the opposite breast.

Fig. 4. The opposite breast of Fig. 3, for comparison.

to visualize than a small one. The commoner circumscribed growths are more easily detected than diffuse tumors. In older women with fatty breasts the opaque growth stands out on the fatty radiolucent background and small tumors are readily discernible. A small tumor in a breast already the seat of fibrosis is difficult to detect. Fortunately, this combination is uncommon. More difficult are diffuse growths, especially when they occur in the well developed breasts of younger women. Two modes of diffusion especially require the discerning eye of an experienced radiologist for their detection. The first is distinctive of one type of lobular carcinoma described by Stewart. The growth infiltrates along the course of the ducts, but not within them. The small, deeply staining carcinoma nuclei are found singly or in small columns surrounded by abundance of dense fibrous tissue. The carcinoma is comparable to "linitis plastica" in the stomach. It infiltrates everywhere, but the focus of origin may be impossible to find. Hence, in the film, there is no recognizable tumor mass. What can be seen is a change in contour of the mammary gland itself. This, together with retraction of the nipple, will

point to the diagnosis. The second type of diffuse carcinomatous infiltration is due to lobular spread. In certain cases in younger women, a carcinoma arising in a duct may, as it were, "infect" the lobules belonging to that duct system. There is a direct change of cells lining the ductules of the affected lobules into carcinoma cells. Growth of ductules takes place in the first half of the cycle. During the second half, corresponding to the secretory phase in the endometrium, the epithelial cells differentiate. Should the epithelial cells come under the influence of the carcinogenic agent during the proliferative phase, differentiation does not occur. They continue to grow and a new focus of carcinoma results (10). Usually the lobules so affected are near the main growth and soon fuse with it. Radiologically, the mass then appears circumscribed; but it may rarely happen that the primary focus is small and diffusion *via* lobules is extensive. In this case, the x-ray film may show no visible tumor, and the only sign might be alteration in contour of the mammary gland.

3. Character of the Tumor Margin: The margins of a tumor, diagnostically speaking, are most important for its evaluation on the x-ray film. Provided a margin is partly visible, the diagnosis can be made even when the rest of the growth cannot be seen. In contradistinction to the smooth contour of a cyst or fibroadenoma, the margin of a carcinoma is irregular, and even when the general outline is smooth, close inspection will reveal spicules, tentacles, and sometimes lobules emanating from the tumor. A pathologic section taken through the growth in the same plane as the x-ray film will show their anatomic counterpart, *i.e.*, extensions of the growth into the surrounding tissue. Distinction must be made between these spicules or tentacles emanating from the tumor and the trabeculae which happen to pass over or under it at a different level. In carcinoma, the tumor extensions often cut across the breast trabeculae. Usually the tumor prolongations are seen at any angle and anywhere along the circumference of the opacity which represents the growth (Fig. 3).

4. The Tumor Bed or Perifocal Zone: In carcinoma, the tumor bed shows many differences from the corresponding zone of a benign growth. A benign tumor or cyst pushes the normal tissue aside. A carcinoma, besides causing compression and displacement of breast trabeculae by its mass, also infiltrates and destroys them. There is, therefore, a zone in the immediate vicinity of the tumor where there is a loss of breast architecture; the mammary tissue proper is replaced by occasional clumps of carcinoma cells, irregular fibrosis, and edema. Fine reticulation in the perifocal zone can be demonstrated, provided a high degree of resolution is obtained. This can be done only with non-screen technic under perfect conditions; otherwise, the reticulation appears as a blur resembling edema, instead of fibrosis, which it actually is. A plexus of relatively huge anastomosing vessels is found in this zone. The vessels are not large enough to be seen individually in the film but they add to the general blurred effect of the area. In deep-seated tumors, the perifocal blurring may extend into the pectoral line.

Secondary Signs

Secondary signs are often valuable in confirming a diagnosis of carcinoma and the presence of one or more of them should arouse enough suspicion to incite a careful search even if no tumor is immediately visible.

5. Alterations in Position of the Nipple: Alterations in the position of the nipple can be accurately demonstrated by the x-ray film, but seldom better than can be done clinically.

6. Skin Changes: Changes in the skin are easily and accurately demonstrated roentgenographically. Besides obvious dimpling and retraction, the skin shows a localized thickening over the tumor area before the change becomes clinically manifest. The affected skin must, of

Fig. 5. The whole section of the breast shown in Figs. 1–3. The carcinoma with its radiating spicules may be compared with the x-ray appearance in Fig. 3. The pathologic section was cut longitudinally, at right angles to the caudad view in the x-ray film.

This patient was 65 years old. The mass had been present eight months and was approximately 6 cm. in diameter by palpation.

course, be seen in profile. The tumor is usually situated some distance below the skin. The chief pathologic change is fibrous thickening of the dermis, which becomes very marked in long-standing cases. Carcinoma cells are seldom seen in the area. When the carcinoma is immediately below the surface, the overlying skin may be thin and atrophied.

7. Changes in the Trabeculae (Stroma and Parenchyma): Changes in the trabeculae are often prominent on the x-ray film, although seldom alluded to by the pathologist intent on examination of the tumor and its immediate surroundings. The markings due to the trabeculae at a distance from the tumor are usually wider and denser in the carcinomatous than in the opposite normal breast. In very large tumors the widened trabeculae may be seen pushed to one side and crowded together. The thickening of the trabeculae is due partly to generalized proliferation of fibrous tissue, such as is found in the vicinity of most carcinomas, partly to proliferation of the specialized myoepithelium from which intraductal (subepithelial) fibrous tissue is derived (22). These changes have been nicely shown in the whole breast sections made routinely as part of our pathologic studies (Figs. 3 and 5).

8. Increased Vascularity: In addition to the plexus of the tumor bed, the x-ray film may show large vessels either locally about the tumor or generally in the subcutaneous fat layer of the breast. This feature is also often overlooked by the pathologist in his microscopic sections, but is quite obvious to the roentgenologist.

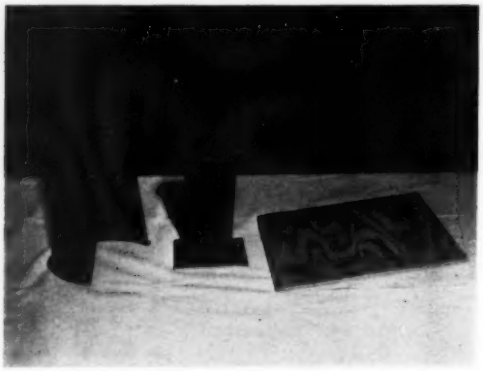

Fig. 6. Cones and angled board used for making x-ray examinations of the breast.

DIFFERENTIAL DIAGNOSIS

Benign growths and cysts have a wide range of visibility in x-ray films. They are easily obscured by the dense breast tissue of young women, whereas in an atrophic fatty breast they may be seen with ease. In any case, their benign nature may be established by exclusion, since the diagnostic criteria for malignancy are lacking. Furthermore, these lesions are distinguished by special features.

(*a*) Fibroadenomas are encountered in a younger age group than most carcinomas. The density of the tumor is apt to be the same as that of the perifocal tissues, but when the outlines can be distinguished they are smooth, even if the contour is bosselated or lobulated. Surrounding struc-

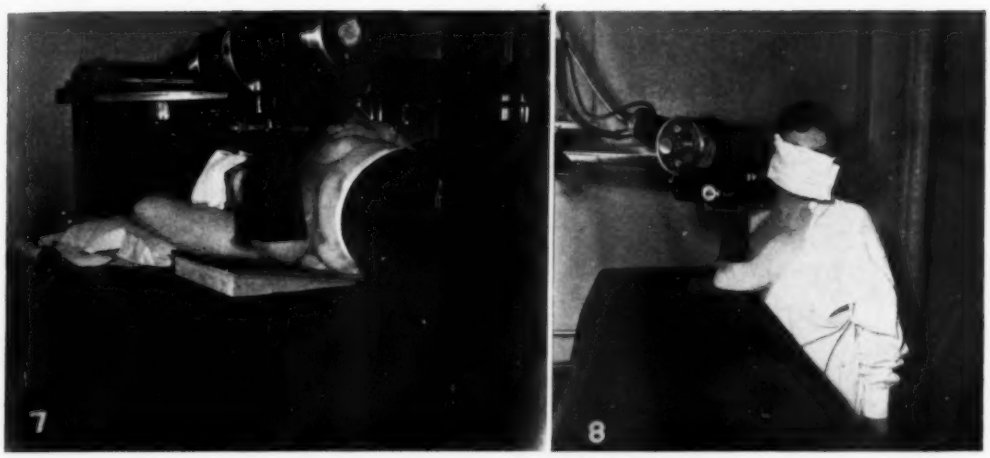

Fig. 7. Larger cone with cut out sector for examination of the entire breast.
Fig. 8. Short cone used with gentle compression for obtaining spot film of breast at 30–40 cm. film-target distance.

tures may be displaced but are not invaded. There is no increased vascularity.

(*b*) Cysts have smooth contours. A single cyst is circular rather than bosselated but a mass of cysts may have a lobulated margin. The breast may show a criss-cross pattern due to deformity by the bulky cysts, but this does not resemble the tentacles of a cancer. Occasionally, in hyperplastic areas, increased vascularity can be made out, but in the absence of other signs this should not influence the diagnosis.

(*c*) Secretory cystic disease, especially when complicated by plasma-cell mastitis (3), may present a picture closely resembling a malignant process. Pathologically the breast ducts in the affected areas are distended with inspissated secretion. Around them there is often inflammation of the type known as plasma-cell mastitis, together with fibrosis. The x-ray film in secretory cystic disease presents a fuzzy opacity with lack of any definite pattern; in plasma-cell mastitis the infiltrations coalesce into an irregularly shaped mass, often with bizarre extensions. These may be distinguished from the tentacles of carcinoma because they follow the pattern of the trabeculae. Hypervascularity and swelling of the skin may be present, and there may be retraction of the skin or nipple. In the last analysis the diagnosis may be clinched by clinical and x-ray measurements of the lesions. In secretory disease the mass is apt to be extremely indefinite. A carcinoma of equal size would be readily palpable.

(*d*) A papilloma can seldom be demonstrated directly, but its site is marked by a localized dilatation of the duct (12, 26). Papillomas are often multiple and the ducts containing them appear varicose or beaded on the x-ray film. Intracystic papillomas may be suspected when a cyst stands out with unusual distinctness. The increased density is due to hemorrhage from the papilloma causing a deposit of hemosiderin in the wall of the cyst.

(*e*) Abscess is usually clinically obvious, since most cases occur in the lactating breast. Radiologically, however, there is some resemblance to malignant disease of the diffuse type. Both may show distortion of the stromal pattern, undue prominence and swelling of the trabeculae and skin, with generalized hypervascularity. Abscess in older women is uncommon and is usually chronic. The chronic abscess sometimes seen in conjunction with papilloma is situated, as a rule, beneath the nipple and may be very large. It often has a fibrous tissue capsule and its margins would therefore appear sharp.

Fig. 9. Punctate calcium deposits in a comedo and duct carcinoma which was confirmed by microscopic examination. The patient was 64 years old. She complained of "soreness" in her breast for eight months, but a tumor had not been noted until ten days prior to the x-ray examination.

(*f*) Infective granulomas of the breast are rare in this country. In tuberculosis especially, the manifestations are so protean that to give any satisfactory account of its appearance in the x-ray film would require opportunities not available here. Tuberculous lesions may closely resemble those of plasma-cell mastitis, so much so that at one time the proposition was seriously advanced that plasma-cell mastitis was only a form of tuberculosis. In the present state of our knowledge, bacteriology and hematology should be relied on for diagnosis of infective granulomas rather than x-ray examination.

DISCUSSION

Training technicians for proper examination of the breast is not easy. The use of male technicians is further handicapped by the sensitivities of the female patient. It often requires some manipulation of the breast to bring it into close contact with the film so as to obtain a lateral view without a superimposed shadow of the opposite breast. This should be done gently and without undue pressure or traction. Multiple films frequently must be obtained before the technicians learn to select the proper exposure factors. Non-screen film is critical, and a variation of 1 to 2 kv. from the optimum can ruin an examination. A film of a fatty breast can be obtained with 5 to 10 kv. less than is necessary for a breast of similar size composed of glandular, cystic, or fibrous tissue. Because of these difficulties, it has been our experience that the physician himself should train technicians for this examination and always select the particular site in the breast for the special spot-film study. Soft-tissue radiography demands familiarity with precise technical requirements not necessary in ordinary studies (5).

In the hands of an expert, and granted adequate technic, a reliable roentgenologic diagnosis may be expected in 90 to 95 per cent of cases. This degree of accuracy depends to some extent on knowledge of the patient's age, history, and clinical findings. Moreover, the radiologist must be able to recognize the various patterns of the normal breast in all age groups and under different degrees of nutrition and physiologic activity. Only then can the findings be properly evaluated (8, 9). With regard to carcinoma, size of the tumor, as we have said, makes practically no difference, and in doubtful cases the radiologist is often certain when the clinician hesitates. Besides confirming the diagnosis of carcinoma, a good x-ray study can exclude malignancy in some cases where it was considered probable on clinical grounds. Fortunately both breasts are always examined, so that the opposite breast of each patient is available for comparison. It must be emphasized that the diagnostic pitfalls are chiefly technical, not interpretive.

Biopsy has more and more become a

standard procedure in the diagnosis of breast disease, so much so that it threatens to become routine in all patients. We have heard the slogan, "The microscope cannot lie!" Perhaps not, but there are few pathologists who would claim equal veracity. We would be the last to deny the value of biopsy in selected cases, but we do affirm that, again in selected cases, x-ray diagnosis is equally accurate. Actually, the two are complementary.

There are two groups of cases in which biopsy is contraindicated:

1. Masoplastic breasts, especially in younger women: The surgeon would agree that operation is not necessary, but often the effect of propaganda on nervous patients is such that they cannot be satisfied unless "something is done." The tangible evidence of the x-ray film will go far to convince these patients that their fears are groundless.

2. Clinical carcinoma, confirmed by x-ray: The surgeon is enabled to proceed with radical mastectomy without preliminary biopsy.

The next two groups illustrate the value of the x-ray film in planning the operation:

3. A mass is present, the clinical diagnosis is uncertain, and the x-ray diagnosis is negative for carcinoma: The surgeon would excise the lesion, but need not remove the surrounding healthy breast.

4. A mass is present, the clinical diagnosis is uncertain, but the x-ray film suggests carcinoma: A biopsy is necessary, but the surgeon would be prepared to excise widely around the tumor.

Immediate exploration is indicated in the following groups:

5. When both clinician and radiologist are uncertain of the nature of a tumor.

6. When the radiologist discovers a previously unsuspected malignant tumor, either in another part of the diseased breast or in the opposite breast.

SUMMARY

Technical details for the successful x-ray examination of the breast are reviewed. The best results were obtained by the use of non-screen films, 30–38 kv; 200–400 ma., fine-focus tubes, 30–75 cm. film-target distance, depending on proximity of tumor to film. Spot films, gentle compression, and a localizing skin marker are used for demonstrating any isolated palpable lesion.

The primary diagnostic x-ray criteria of malignancy are as follows:

(1) The size of the tumor is less in the film than that determined by palpation.

(2) The radiopacity of a malignant tumor is apt to be greater than that of the surrounding tissues; and the more fat in a breast, the greater is the difference in contrast between the tumor and the perifocal structures. We have confirmed Leborgne's report concerning the presence of punctate calcifications in and around many malignant tumors.

(3) The margins of a malignant tumor are irregular, tentacled and spiculated.

(4) The perifocal tissues in the tumor bed of a malignant growth are blurred and distorted.

The secondary x-ray criteria of a malignant tumor are:

(5) Alterations in the position of the nipple.

(6) Local or diffuse thickening of the skin, sometimes with retraction.

(7) Accentuation of the trabeculae, especially if the malignant process is diffuse and widely invasive.

(8) Increased vascularity in the parenchyma and in the subcutaneous fat layer.

The differential diagnosis and the question of biopsy in the light of the x-ray findings are discussed.

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SUMARIO

Carcinoma Mamario. Técnica Radiográfica y Pautas de Diagnóstico

Repásanse aquí los detalles técnicos que figuran en el éxito del examen roentgenológico de la mama. Obtuviéronse los mejores resultados con el empleo de películas sin pantalla, 30–38 Kv, 200–400 ma, tubos de foco fino, distancia foco-película de 30–75 cm., conforme a la proximidad del tumor a la película. Para revelar cualquiera lesión palpable aislada, úsanse radiografías instantáneas, compresión suave y marcapiel localizador.

Las pautas primarias para el diagnóstico roentgenológico de la malignidad son las siguientes: (1) El tamaño del tumor es menor en las radiografías que el determinado por la palpación. (2) La radioopacidad de un tumor maligno es susceptible de ser mayor que la de los tejidos circundantes; y mientras más tejido adiposo hay en una mama, mayor es el contraste entre el tumor y los tejidos perifocales. En muchos tumores malignos y alrededor de ellos obsérvanse calcificaciones punteadas. (3) Los bordes de un tumor maligno son irregulares, tentaculados y espiculados. (4) Los tejidos perifocales del lecho de un tumor maligno aparecen borrosos y deformados.

Las pautas roentgenológicas secundarias para un tumor maligno son: (5) alteraciones de la posición del pezón; (6) espesamiento local o difuso de la piel, a veces con retracción; (7) acentuación de las trabéculas, sobre todo si el proceso maligno es invasor; (8) hipervascularidad del parénquima y de la capa adiposa subcutánea.

Cervical Radium Applicators with Screening in the Direction of Bladder and Rectum[1]

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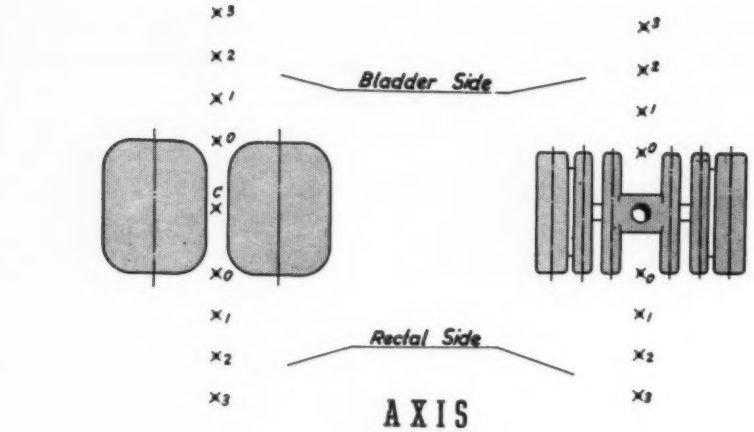
EVER SINCE colpostats were first designed, there has been an attempt to find one that (1) would be easy of application; (2) would maintain a steady position in the fornices without slipping or rotating; (3) would facilitate or eliminate packing; (4) would allow an increase in the total number of milligram hours by better distribution of the radium source and by the addition of differential screening in the direction of the parametria without exceeding the tolerance of bladder and rectum.

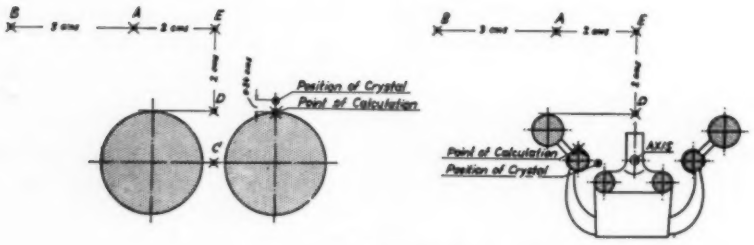
Some applicators, such as those of Neary and Blomfield (1, 3, 9), have been designed on the basis of calculations. They are theoretically superior because they are built with considerable differential screening which allows an increase in dose at point B up to 5,000 gamma roentgens without exceeding the tolerance of bladder or rectum. The disadvantages of using expensive metal and large amounts of radium are no longer valid, since uranium and cobalt^{60} are available. Such applicators, however, have the disadvantage that, being heavy, they rest low in the pelvis, thereby keeping the radium sources at a greater distance from the broad ligament and the pelvic nodes. Recent knowledge as to the distribution of metastatic nodes has further emphasized the importance of increasing the contribution to the hypogastric and external iliac nodes, which are located high and posteriorly on the pelvic wall. For these reasons, extensive clinical research should be done before widespread use of a procedure departing so radically from thoroughly proved technics.

Some applicators combine the uterine tandem and the colpostat in one rigid piece (2, 4). These have the advantage of a fixed geometry between the radium sources, making calculations simpler. They have also disadvantages:

1. Separate plastic or rubber uterine tandems can be fitted better to the length of the uterine cavity. This is essential for adequate irradiation of the cavity, which is often involved. Also, according to recent direct measurements, a greater contribution is thus made to the hypogastric, external iliac, and sacral nodes.
2. The vaginal radium sources are located lower in the vagina. This is especially true in cases of exophytic tumors, in cervices greatly enlarged by infiltrating tumor, in unilateral obliteration of the fornices, and in contraction of the vault due either to senility or disease. In the latter instance the uterine tandem will protrude in the vault and the volume of adequate radiation is brought dangerously close to the level of the internal os.
3. It is often desirable to apply the vaginal radium first (infection, impossibility of finding the os until tumor has regressed, exophytic tumors or cervix greatly enlarged by infiltrative carcinoma).
4. These applicators traumatize, to fit their own geometry, structures which are fixed by the tumor or previous inflammatory conditions.
5. They do not take advantage of the increased depth dose resulting from a greater distance between the radium and mucous membrane.
6. Very high doses are delivered to the vault of the vagina (Table I).

[1] From the Radiotherapy Department, M. D. Anderson Hospital for Cancer Research, University of Texas, Houston, Texas. Accepted for publication in March 1952.





EQUATORIAL PLANE

	EQUATORIAL PLANE					AXIS								EQUATORIAL PLANE VAULT
						BLADDER SIDE				RECTAL SIDE				
	C	D	E	A	B	0	1	2	3	0	1	2	3	
Small Plastic Ovoids 0.5 cm Separation 15 mgs Ra each; 144 hrs	18,800	12,000	2,960	2,480	1,060	5,400	2,150	1,320	920	9,600	4,030	1,900	1,160	11,260 (15,980)
Metal Ovoids 0.5 cm Separation 15 mgs Ra each; 144 hrs	17,600	11,250	2,760	2,340	1,000	4,950	1,770	850	610	6,680	3,080	1,710	950	10,800 (14,980)
Metal Ovoids 1.0 cm Separation 15 mgs Ra each; 144 hrs	12,500	9,000	2,650	2,380	1,010	4,650	1,800	860	620	5,400	2,620	1,490	880	10,010 (14,380)
Metal Ovoids 2.0 cms Separation 15 mgs Ra each; 144 hrs	7,360	5,850	2,280	2,250	1,110	3,730	1,830	940	650	4,300	2,100	1,310	810	9,420 (13,880)
Metal Ovoids 3.0 cms Separation 15 mgs Ra each, 144 hrs	4,800	4,060	1,940	2,110	1,190	3,020	1,730	1,050	690	3,300	1,830	1,160	760	8,870 (13,470)
Metal Ovoids 4.0 cms Separation 15 mgs Ra each, 144 hrs	3,300	2,890	1,650	1,980	1,360	2,330	1,660	1,040	690	2,340	1,590	1,040	690	8,630 (13,310)
Ernst Applicator Fully Open; 100 hrs 6 Ra Sources, 10 mgs ea	11,200 (11,410)	10,900 (10,380)	3,980 (3,498)	3,800 (3,340)	1,820 (1,498)	9,930	4,380	2,510	1,570	9,300	4,500	2,480	1,610	33,240 (43,900)
Ernst Applicator 4 Ra Sources 10 mgs each; 100 hrs			Closed: Half Open: Fully Open:	3,150 2,370 3,180	1,071 1,012 1,071									

1 mm Pt Filtration, 1·5 cms Active Length

( ) = Calculated

TABLE I. DOSES AT POINTS SEEN ON DRAWING. ERNST COLPOSTAT USED FOR COMPARISON

Measurements around the applicators, single and in pairs, were made with a scintillation counter. Assuming that there is no extra packing, the rectum and bladder doses would be represented approximately by the doses

Richards (11) developed an applicator by fastening together the Manchester ovoids and attaching a single handle, which in turn is fastened to a belt. Disks of platinum provide screening in the direction of the rectal wall.

We have developed an applicator along the line of the Manchester technic because it takes advantage of the size of the vagina to increase the number of milligram hours and, therefore, the lateral throw-off (8). Depending on the diameter of the ovoids (2.0, 2.5, and 3.0 cm.) and the length of the uterine tandems, 7,000 to 12,000 mg. hr. are used with a corresponding dose at point B of 1,500 to 3,000 gamma roentgens (10). The increase in volume of adequate irradiation in the direction of the parametria is accomplished in giving between 12,000 and 20,000 gamma roentgens to the vaginal vault, which is much less than is delivered by other technics (up to 40,000 gamma roentgens). It has been observed that the radiation reactions of the vaginal vault and cervix are less.

An attempt has been made to eliminate some of the difficulties of application and the potential risks of the Manchester ovoids:

1. The application, to be correct, should be done with the patient in the knee-chest position. This requires experience which can be obtained in only a few institutions.
2. The ovoids, even with spacer, are not truly placed in each fornix, but lie under the cervix or distal to it. For that reason we have fastened them to separate handles, which are locked by a scissor joint. This increases the parametrial dose and lessens the dose to rectum and bladder (Fig. 2, Table I). Placing the radium sources more centrally and high in the pelvis increases the contribution to the broad ligaments and pelvic nodes.
3. It is often difficult to pack adequately between the colpostats and vaginal wall without producing rotation or slipping. The packing may push the radium sources too far away from the posterior fornix. Screening in the direction of bladder and rectum sometimes keeps the doses under the tolerance limit. Packing is then used only in front of the cervix, to keep the uterine tandem in place, and around the handles to hold them as much as possible in a steep position against the anterior vaginal wall. It helps to keep the ovoids more posteriorly in the lateral fornices.

The applicators have the same diameters as the Manchester ovoids (2.0, 2.5, and 3.0 cm.), but slightly different lengths. They are not oval in shape because one does want an isodose surface. In order to reduce the dosage in the direction of rectum and bladder, tungsten buttons are inserted at each end for the purpose of screening (Fig. 1). The shell is made of brass (or stainless steel), which gives minimal secondary electron emission. For reasons of economy, small metal cylinders can be used, with the addition of plastic jackets to obtain medium and large sizes. The tungsten buttons are not of uniform shape. The rectal side button is a half disk and the

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at 1 cm. above and below. There is a definite gain in favor of the metal ovoids. The advantage of placing the cylinders in each fornix as far apart as possible is seen in the improvement of the dose at point B, and the ratio

$$\frac{\text{Dose at point B}}{\text{Dose at point A}}$$

(Theoretical points A and B, 2 cm. distal to flange and then 2 cm. and 5 cm. laterally. These points have no anatomical significance, point B being exceptionally in the vicinity of the obturator nodes.)

The separation decreases the rectal dose and to a lesser extent the bladder dose due to the shape of the isodose curves.

The applicators are loaded with 15–20, 20–25, or 25–30 mg. of radium, depending upon their separation and diameter. The figures of the table should be multiplied by the corresponding coefficient.

This table has been made for comparative purposes. In clinical work, a three-dimensional procedure has to be used for determination of dosages at all important points.

bladder side button a 150° sector. They are located to provide maximum screening for the anterior rectal wall and trigone of the bladder without decreasing the radiation in the direction of the uterosacral and broad ligaments (Fig. 3). Each cylinder is fastened to a separate handle; these handles are easily locked together with a range of separation from contact to 4 cm. When there is shortening of one fornix, the cylinders are placed in tandem and handles are held together with adhesive tape to allow maximum adaptation to the distortion caused by disease. If the direct measurements on the anterior rectal wall are under tolerance, packing is used only in front of the cervix and around the handles. It should be tight to prevent slipping of the uterine tandem and rotation of the colpostat. The ends of the handles have a round flat surface, protruding from the vulva a few centimeters. This arrangement is not uncomfortable to the patient and allows a quick check every day to see if rotation has occurred. If it has, it can easily be corrected.

In view of the small difference (less than 5 per cent) in dosage rate in the equatorial plane between the two types of applicator, no radical departure is now being made with the radium loading we used in plastic ovoids. The loading depends on the separation: 15–20, 20–25, and 25–30 mg. respectively in small, medium, and large cylinders. The uterine tandems, depending upon their length, are loaded with 15, 15–10, and 15–10–10 mg. The uterine loading is somewhat higher (15–15–10), and the vaginal loading is diminished (15, 20, 25) if the lesion is more infiltrative and if there is no retroversion or extreme anteflexion. The application time is determined by the measurements in bladder and rectum, not to exceed 3,500 gamma roentgens to the bladder and 3,000 gamma roentgens to the rectum for each application. A second application is made ten days later. If colpostats and uterine tandems are used

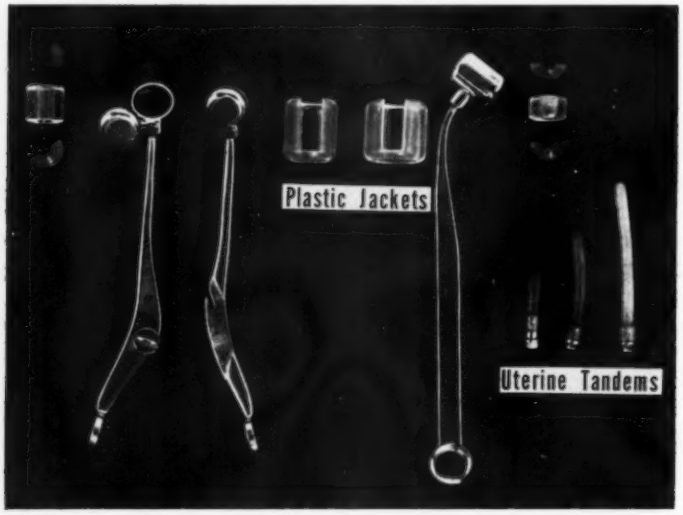


Fig. 1. A. Photograph of applicators. A pair of cylinders (2 cm. diameter), with interlocking handles and one single cylinder with a straight handle. Plastic jackets of two thicknesses are added to make medium and large sizes (2.5, and 3 cm. diameter). The tungsten buttons are in their true position in relationship to the axis of the cylinders. The applicators have the same diameters as the Manchester ovoids, but not the shape of an isodose surface. The separation ranges from contact to 4 cm., *i.e.*, 2 to 6 cm. for the radium sources. The handles have notches to give points of reference for three-dimensional reconstruction.

separately, the insertions are made weekly (three or four). Not infrequently one ovoid only (as large as possible) is introduced in contracted vaults in one or both insertions (20, 25, 30). If the disease involves the lower part of the vagina, a cylinder along the vaginal axis is usually employed for the second insertion. The total treatment time for both tandem and colpostat ranges between 100 and 144 hours. Direct measurements in rectum to take advantage of the size of the vagina, radium therapy is given first. However, in large or infected or markedly ulcerating lesions with obliteration of one or two fornices, treatment is first by external irradiation (1,500 to 2,000 r tumor dose) and the radium dosage is reduced accordingly—about 25 per cent for 2,000 r tumor dose, not exceeding 6,000 r (radium and x-ray) to the bladder and 5,500 r to the rectum. Films are taken routinely to

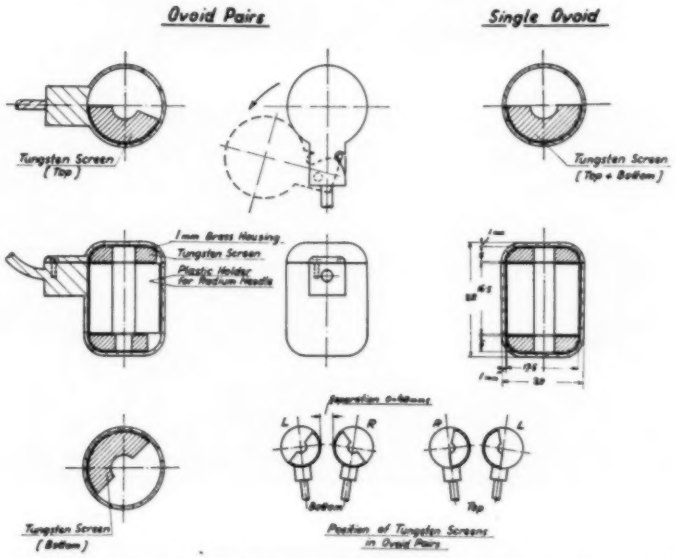


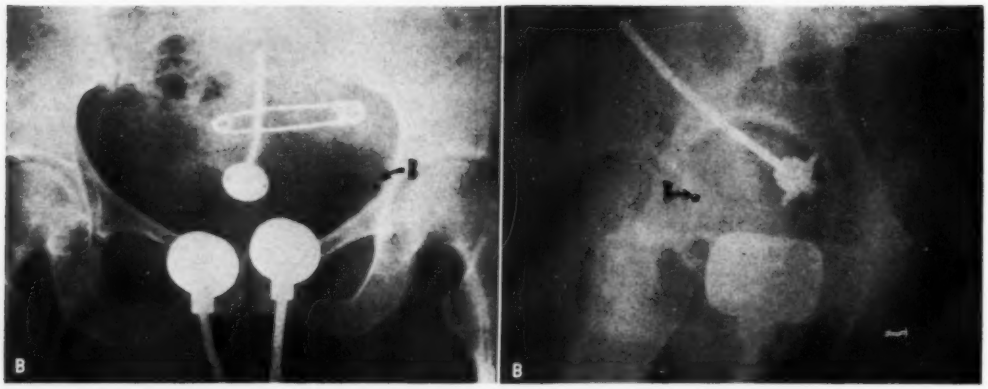
Fig. 1. B. Detailed drawing of applicators and components. The central hole of the plastic inserts can be made to accommodate platinum capsules of various diameters. The radium capsules are not centrally located along the axis of the ovoids but are displaced by gravity to the rectal side. This is advantageous for two reasons: (1) The uterine tandem contributes heavily to the bladder dose. (2) The cylinders have the tendency to be located high in the lateral fornices. A lower position of the radium capsules partially compensates for it.

and bladder, done at the time of implantation, have shown tremendous variations in dosage rate for the same radium system with the varying geometry of individual cases. Tables of dosages for the complete radium system are therefore meaningless for determinations of dosage.

Dummy plastic ovoids of the same size as the metal applicators are used in the clinic to determine the proper size. Care is taken to see that the dummies fit loosely, so that the metal ovoids will be positioned as high as possible in each fornix (Fig. 2). In order check the position of the applicators and to calculate doses at the important points.

Calculation of dosages at the theoretical points A and B is not adequate from the point of view of either anatomy or pathology of the disease because they are not representative of any structure.

Doses at various points of the pelvis can be obtained only with a three-dimensional dose finder based on radiographic localization of these points for each case in relationship to colpostat and uterine tandem. The possibility of underdosed points in the



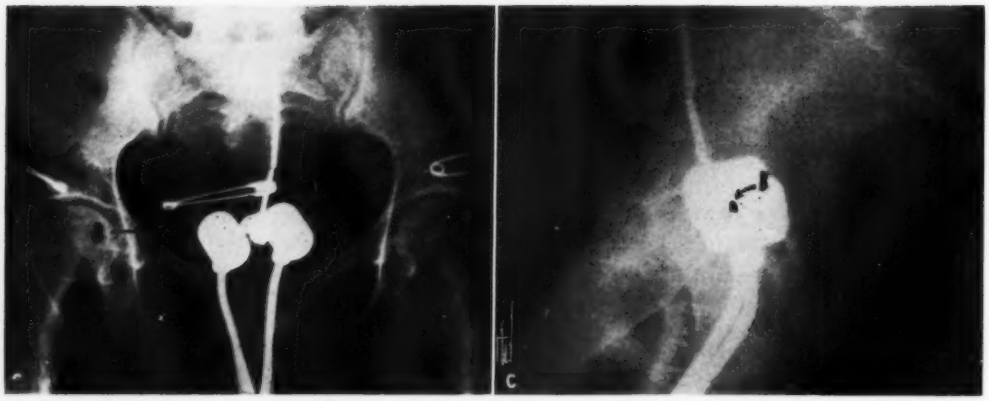


Fig. 2. The flange of the uterine tandem is between the cylinders, which are correctly placed in each fornix (Fig. 2A). This increases the dose to the pelvic wall not only laterally (close to anatomical point B representative of "obturator nodes" group, located 1 cm. medially on the inner surface of the acetabulum), but higher and posteriorly due to a more central location of radium sources. It also decreases rectum and bladder doses. See Table I.

Obliteration of fornix and cone-shaped vault. The ovoids are too large (Fig. 2B). The radium sources are too low in the pelvis. On second insertion (Fig. 2C) the proper size was fitted, and the applicators are more centrally located.

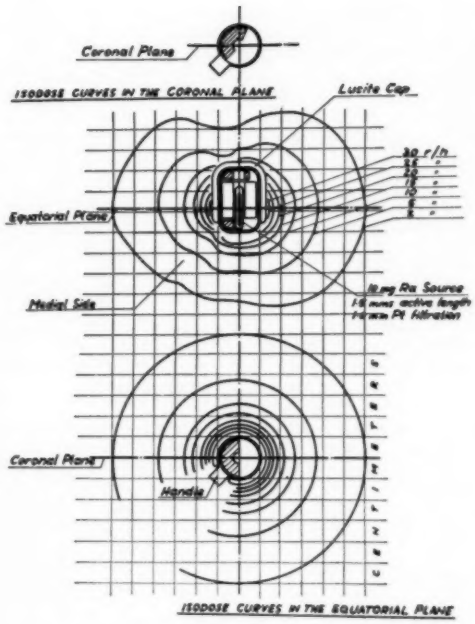


Fig. 3. Isodose curves in coronal and equatorial planes. One notices the asymmetry of the curves due to the screening and rectal-wise displacement of the radium. The dosage rates in roentgen/hour are for 10-mg. sources (1.5 mm. active length). Dosage rates for other sources of the same active length are obtained by multiplying by a coefficient (e.g., for 25 mg. multiply by 2.5). If the active length is slightly different, the error is clinically not significant. The isodose curves are used with a dose finder. Simple computations, when the distance between the applicators is known, give the dose to the vault and any point in the coronal or equatorial planes. The addition of lucite caps does not affect the isodose curves.

vicinity of the cervix in apparently satisfactory insertions has already been demonstrated. Failures attributed to unusual radioresistance may be due to such "cold spots."

Actual measurements taken in rectum, bladder, and along the pelvic wall with a scintillation counter at the time of the implantation add valuable information. Depending on the findings of both approaches, changes may be made in the distribution and intensity of the radium sources, and measures found to diminish the incidence of faulty applications.

It must be remembered that there is no universal applicator, and that in a certain percentage of cases no satisfactory arrangement of intracavitary radium sources can be obtained. Interstitial irradiation, transvaginal therapy, heavier external irradiation, and combinations of those technics are useful in such cases.

ACKNOWLEDGMENT: The author wishes to express his indebtedness to E. B. Moore, draftsman-engineer, for his valuable suggestions in the design of the applicator.

Physical Study[2]

ROBERT J. SHALEK, M.A., and ARTHUR COLE, B.A.

The physical measurements were taken in air with a scintillation counter employing a 931A photomultiplier tube and a spherical potassium iodide crystal of 1.4 mm. diameter. The crystal was embedded in the end of the light-conducting lucite rod and sealed in mineral oil. In this arrangement the response to radiation is independent of the direction of the radiation. The total current was read on a galvanometer. The scale of the galvanometer was calibrated to read directly in roentgens/hour from the calculated roentgens/hour at various distances from a source of radium (approximately 10 mg., 1 mm. Pt filtration, 1.5 cm. active length) with a known content (National Bureau of Standards calibration). Since the change in wave length due to various thicknesses of air at the various points studied is negligible, the wave-length dependence of potassium iodide can be disregarded.

All applicators were loaded with single sources, each containing about 10 mg. radium, with 1 mm. Pt filtration. Their nominal content was checked against the content of the source used as a standard. The dosage rate was measured at various points and the values in the table were obtained by allowing for treatment time and

[2] From the Physics Department, M.D. Anderson Hospital for Cancer Research, Houston, Texas.

respective loadings used in actual therapy. If the radium supply necessitates the use of two or three radium sources instead of a single source, some correction factor may have to be applied for self-screening. Data in gamma roentgens at various distances of the radium applicators obtained by measurements in air should be applicable to points at the same distances in tissue-like materials, as it is generally admitted that within a short distance from radium sources scattering makes up for the absorption (5, 12).

The calculated values were derived from the tables of linear sources (7) and by use of the formula for filtered line sources (12):

$$I_\rho = \rho_h \left(\int_0^{\theta_2} e^{\frac{-\mu d}{\cos\theta}} d\theta - \int_0^{\theta_1} e^{\frac{-\mu d}{\cos\theta}} d\theta \right)$$

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SUMARIO

Aplicadores Cervicales de Radio con Pantallas hacia la Vejiga y el Recto

A base de la conocida técnica de Manchéster, se han elaborado aplicadores de radio, destinados al cuello uterino. Esos aplicadores tienen los mismos diámetros que los ovoides de Manchéster, pero el largo es algo distinto. En forma, no son ovales, pues no se desea obtener una superficie de isodosis.

La cápsula es de latón o acero inoxidable, llevando botones de tungsteno para reducir la dosis hacia el recto y la vejiga. Para mayor economía, pueden usarse pequeños cilindros metálicos que se envuelven en camisas hechas de material plástico para conseguir así un tamaño mayor. Cada cilindro va asegurado a un mango separado, siendo fácil entrelazar los distintos mangos con un espacio hasta de 4 cm. de distancia entre ellos. Si hay acortamiento de un fórnix, los cilindros se colocan en tándem, uniéndose los mangos con tela adhesiva para permitir la adaptación máxima a la deformidad creada por la enfermedad. La carga depende de la mayor o menor separación: 15–20 mg., 20–25 mg. y 25–30 mg., respectivamente, para los cilindros pequeños, medianos y grandes; 15 mg., 15–10 mg. y 15–10–10 mg. para los tándems uterinos.

La duración de la aplicación se determina por las mediciones en la vejiga y el recto, sin que exceda de 3,500 y 3,000 roentgens gamma, respectivamente. Si se usan por separado colpóstatos y tándems, las inserciones se verifican semanalmente (tres o cuatro). Excepto en circunstancias especiales, la aplicación del radio precede a la irradiación roentgen externa.

Automatic Cassette Changer for Angiography

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IN THE DEVELOPMENT of angiography, many types of apparatus have been designed to accomplish rapid serialization of the examinations. Some of these require special films and darkroom procedures which are not routine in the standard radiographic department. In this paper we shall describe the construction and operational details of an automatic cassette changer which has proved useful in various angiographic examinations. The device is easily constructed from materials which are available to any carpenter and requires no complicated machinery. It uses the standard 10 × 12-inch cassette, does not easily get out of adjustment, and can be built at a fairly low cost.

Schwarzschild (1) described a device which exposed 10 × 12-inch films by passing the cassettes from a magazine compartment across a vertical aperture to a receiving compartment on the opposite side. Campbell and Lockhart (2) modified Schwarzschild's apparatus and published their improvements. They use a hand-operated thrust bar which feeds the cassettes across the front of the apparatus and, on the return stroke, activates a switch connected to the timer circuit of the x-ray machine. The film is exposed while it is momentarily at rest in the aperture. The machine operates on both the vertical and the horizontal planes.

Our apparatus is a still further modification of that of Campbell and Lockhart and was devised in an attempt to overcome the difficulties attendant upon hand operation.

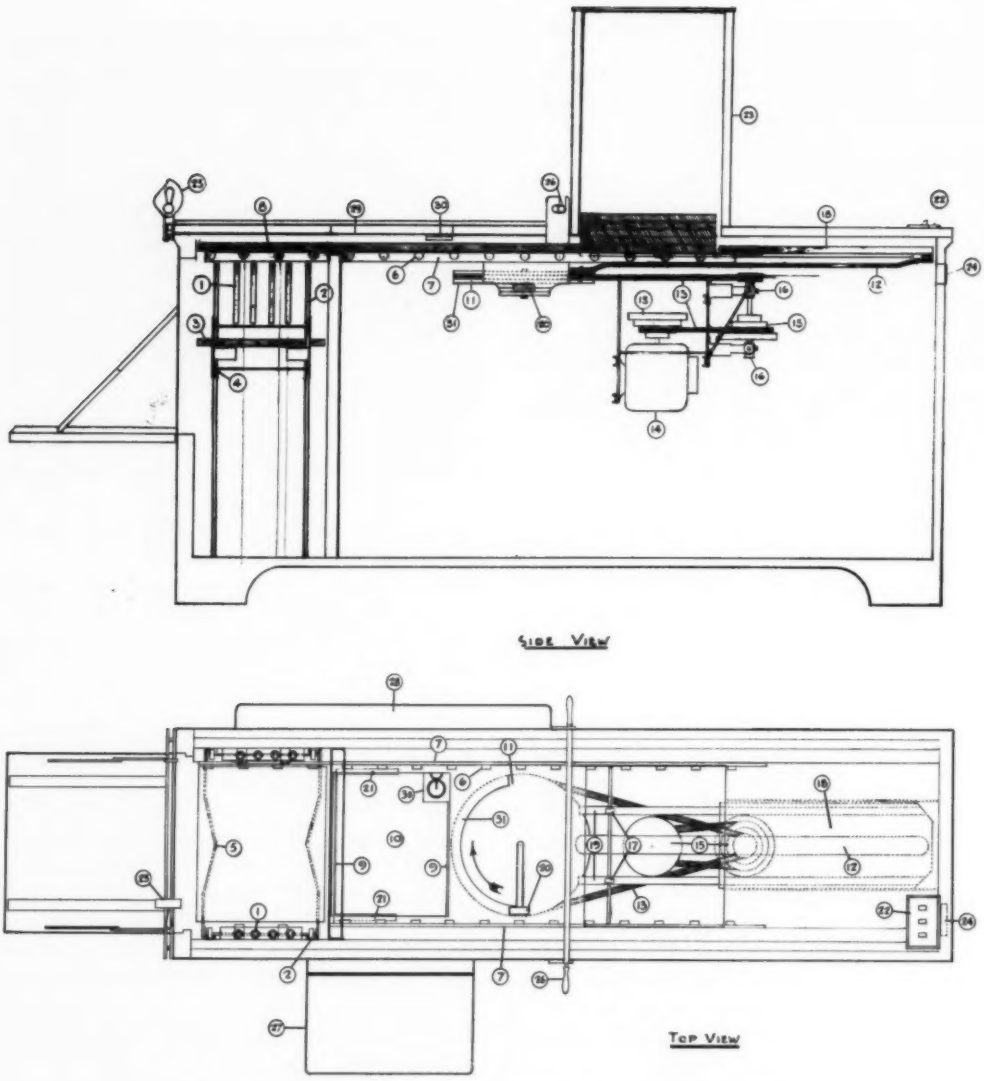
The machine is automatic, being driven by an electric motor. Smoothness of operation and freedom from "jamming" have been accomplished by passing all moving parts over roller bearings, eliminating undesirable "free play" from any of these parts. Screw heads and similar objects used in construction have been counter-sunk so that no projections exist in the channel for the cassettes to interfere with their smooth travel.

Preliminary trials indicated that cassettes must be carefully examined before introducing them into the machine. Cassettes which are not truly square at the corners and those having loose bands or tabs on the backs will cause the device to jam. These difficulties are easily avoided by exerting reasonable care in the selection of cassettes when loading the magazine.

The cassettes are placed, bakelite side up, in the vertical loading magazine. Each cassette is transferred by gravity to the cassette channel and there rests on roller bearings. It passes horizontally through three positions or compartments, 11 1/8 inches in width (the width of the standard 10 × 12-inch cassette), and finally into the receiving magazine. The first compartment, in front of the feed plate when the latter is in the fully cocked position, is called the breech position (Fig. 1). It is important to note that in this position none of the weight of the cassette rests on either the feed plate or on its guide rails. The cassette is supported entirely on roller bearings and is merely pushed through the channel by the feed plate, which is similarly supported. Friction is reduced to a minimum, therefore, and one of the principal factors in jamming the device is controlled.

The cassette feed plate, driven by the electric motor, is thrust forward for a

[1] From the Departments of Radiology and Pediatric Cardiology, the Henry Ford Hospital, Detroit, Mich. Presented as an exhibit at the Thirty-eighth Annual Meeting of the Radiological Society of North America, Cincinnati, Ohio, Dec. 7–12, 1952,



Figs. 1 and 2. Sketch of working mechanism: side and top views

1. Eight springs to suspend cassette-receiving platform.
2. Guide rails for cassette platform.
3. Cassette-receiving platform.

4 and 5. Roller bearings (4) riding in channels on the supporting framework (5) for the receiving magazine table.

6 and 7. Roller bearings (I.D. 1/4 inch, O.D. 3/4 inch) attached to the cassette guides (7). The cassette guides are made of T-iron and prevent side sway of the cassette as it runs over the roller bearings.

8. Cassette.
9. Aluminum stock, 1/8 × 3/4 inch, fixed on the long sides of the grid supports.
10. Cassette exposure aperture to hold a Schönander grid.
11. Belt-driven drive wheel.
12. Connecting crank arm.
13. Z MO 58 V belt.
14. Electric motor: 1/3 horse power; 1,725 RPM. Capacitor starter to overcome the initial high torque.
15. Step-V pulleys. Steps have diameters of 2, 3, 4, and 5 inches.
16. Swivel bearings above and below the pulley to maintain its position.
17. Load bearing, having the same dimensions as the other bearings for feed plate guide.
18. Cassette feed plate.
19. Feed plate guide.
20. Micro-switch. Normally open. Single pole. Pressure spring operated.
21. Brake spring made of phosphor-bronze 15/1,000 inch × 3/4 inch. Not shown in side view.

(*Legend continued on facing page.*)

distance equal to the width of the cassette. This forward stroke pushes the cassette into the second or "ready" position, where it is protected from stray radiation by lead shielding. The return stroke of the feed plate leaves the first cassette in the second position and, in the fully cocked position, opens the breech position so that another cassette may drop into it. The subsequent forward stroke of the feed plate carries the number two cassette into the ready position and simultaneously forces the number one cassette into the exposure position. Upon returning to the cocked position, the feed plate again opens the breech beneath the loading magazine to receive a third cassette. The following forward stroke discharges the number one cassette into the receiving magazine, where it drops a distance of 4 inches to the receiving tray, and brings the number two cassette into the exposure position, etc. In this manner the machine operates rapidly and smoothly, since the human error inherent in a hand-operated device has been eliminated.

To elucidate more fully the construction of the cassette changer, the different positions may be described in more detail. The *breech position* is important. In the fully cocked position, the forward edge of the feed plate should coincide with or be slightly behind the back edge of the loading magazine in order that the cassette may drop freely into the breech. Since the cassettes in the loading magazine rest directly upon one another, it is obvious that the feed plate must be of less thickness than the individual cassette, since otherwise the feed plate would be pushing against two cassettes rather than one. The guide rails of the feed plate in this position, as has been stated above, do not support any of the weight of the cassette. They are used merely to control the path of the feed plate and to insure that it makes contact with the side of each cassette evenly and thrusts forward in a straight line at all times.

Fig. 3. Front view, showing cassette feed magazine, access door, restraining hand mechanism, and electric switches.

The *ready position* involves no special construction. Roller bearings, here and elsewhere, are spaced along the sides of the cassette channel at intervals of 4 inches, and these serve as the sole support of the cassette.

The *exposure position* has an aperture above it where the timing clock is located. This clock is electric and may be turned on at the time the opaque medium is injected. It is photographed on the film, and in this way an accurate record of circulation time is obtained. On each of the long sides of the exposure aperture is a thin aluminum stock edge to support the stationary Schönander grid. This grid is removable for use elsewhere in the department as it is needed.

The fourth, or *receiving, position* involves a few innovations in construction. All projecting edges of any kind have been eliminated to permit the cassette to drop freely and quickly from the path of the

22. Three gang Despard switches. Single pole.
23. Cassette feed magazine.
24. Six conductor female receptacle for connection to control panel.
25. Restraining band crank.
26. Restraining band anchor bar.
27. Head support.
28. Brackets to connect to Bucky table.
29. Grid.
30. Cassette counter.
31. 175° contact segment for exposure switch on the underside of drive wheel.

Fig. 4. Back view, showing head support, cassette receiving mechanism, exposure aperture with grid, and access door.

following cassette. To prevent damage to the cassette, the receiving tray is suspended by eight suspension springs, four at each of the short sides of the receiving magazine. The spring loading of the tray is such that the distance through which each discharged cassette must drop is only 4 inches, and this distance is constantly maintained by the springs whether the tray is empty or heavily loaded. The short sides of the tray are attached through roller bearings to vertical guide rods in order to permit friction-free movement of the tray up and down in the receiving magazine.

Film exposure is accomplished through a micro-switch placed beneath the drive wheel. On the under surface of the wheel, through a 175-degree arc of its perimeter, there is a contact segment 1 1/2 inches wide and 1/4 inch thick (Fig. 2). This segment is fixed to the drive wheel in such a manner that its leading edge closes the micro-switch immediately after the cassette has come to rest beneath the exposure aperture, and holds the switch in the closed position for the duration of the return stroke of the feed plate, at which time the following edge of the segment permits the micro-switch to open. In this manner, exposure of a cassette in motion is avoided. The duration of the exposure is controlled by the timer on the control panel. This may be set for any interval of time during the period that the micro-switch is held in the closed position. Opening the micro-switch discontinues automatically x-ray production in the tube.

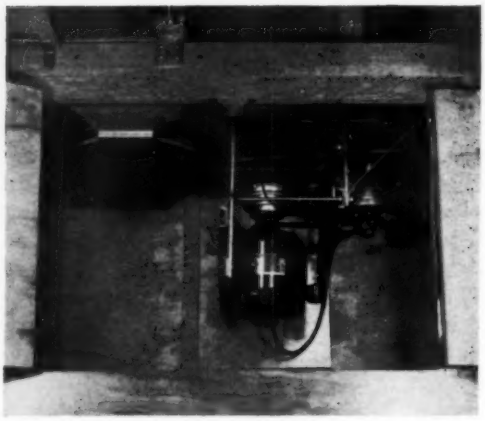


Fig. 5. View through access door, showing motor power mechanism.

Our present model of this device permits us to take films at rates of one per second and two per second. Either speed can be accomplished by adjusting the position of the V-belt between two step-V pulleys which transfer the power of the motor to the drive wheel. By changing the dimensions of the step-V pulleys, it would be possible to take films at almost any rate of speed.

The power train of the machine is easily apparent from Figures 1 and 2. The electric motor (14) transfers power across the V-belts (13) *via* the step-V pulleys (15) to the belt-driven drive wheel (11). The drive wheel transmits power directly across the metal crank arm (12), which is fixed eccentrically to the drive wheel, to the cassette feed plate (18), which has a forward and back motion and pushes the cassettes successively through the cassette channel.

The x-ray equipment used with this

device is a 200-ma. rotating anode tube with a timer permitting exposures from 1/20 second. With this equipment, the results have been such as to prove the value of this cassette changer in a department in which larger x-ray equipment might not be available.

The cost of building the first model has been estimated at seven hundred dollars. Now that the design has been established, however, it should be possible to construct subsequent models for about five hundred dollars. All materials used in making this model are readily available, and no special equipment is needed.

Howard P. Doub, M.D.
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Detroit 2, Mich.

REFERENCES

1. SCHWARZSCHILD, M. M.: Multiple Cassette Changer for Angiocardiography. Device for Rapid Serial Radiography. Radiology **40**:72–74, January 1943.

2. CAMPBELL, J. A., AND LOCKHART, P. B.: Improved Vertical and Horizontal Multiple Cassette Changers for Contrast Angiography. Radiology **54**: 559–566, April 1950.

Fig. 6. End view, showing cassette-receiving platform with spring suspension.

SUMARIO

Cambia-Chasis Automático para la Angiografía

El cambia-chasis aquí descrito está destinado a empleo en la angiografía. Lo impulsa un motor eléctrico y se obtiene funcionamiento uniforme haciendo pasar todas las piezas movibles sobre rodillos de cojinete para eliminar todo inconveniente desengranaje de dichas piezas. Los chasis son trasladados por la fuerza de la gravedad de una cámara de carga vertical al canal para chasis, en el que son despachados sucesivamente a través de tres posiciones o compartimientos, designados como "recámara," "listo" y "exposición." Después de la exposición, el chasis es lanzado a una bandeja receptora suspendida de ocho muelles. La carga de los muelles de la bandeja es tal que la distancia que tiene que descender cada chasis descargado no pasa de 10 cm. La exposición de la película se realiza por medio de un microconmutador colocado debajo de la rueda impulsora.

Pueden tomarse radiografías a razón de una o dos por segundo, determinándose la velocidad por el ajuste de la posición de una correa en V entre dos poleas conoideas en V.

Esta aparato es construído fácilmente con los materiales que tiene a mano cualquier carpintero y no necesita maquinaria complicada. Utiliza chasis de 25 x 30 cm.

EDITORIAL

"Life is Short, and the Art Long; the Occasion Fleeting . . ."

In the future, more comprehensive and accurate diagnosis in medicine will depend on the improvement and expansion of the objective methods of examination. The most important of these methods has been the application of the roentgen ray. No field in medicine has enjoyed a comparable growth or seen so widespread utilization as that of diagnostic roentgenology. Its contributions to medical progress within the past fifty years have been phenomenal and at times startling. Today it still offers the investigator a broader field and one of more diversified interests in which to make worth-while contributions than most other specialties.

The pre-eminent position held by diagnostic radiology can and will be maintained because no other medium has yet been discovered or devised for the visual demonstration of the anatomy, physiology, and pathology of the organs and structures concealed within the human body. The fact that several of the major organs and many different structures still elude satisfactory visualization by the roentgen ray provides a rich reservoir for future research, not only for their anatomic and pathologic demonstration, but also as to their physiologic functions. The questions can then be asked, "How best to tap this reservoir?" "How best to stimulate interest in its contents?" "How best to provide the facilities for withdrawing this knowledge?".

Webster defines research as, "the diligent and systematic inquiry or investigation into a subject in order to discover facts or principles." No one can foretell in whom, or where, or when, "the diligent effort" will be aroused. This process requires the "spark" of medical curiosity, the tenacious determination to pursue a thought to a conclusion, and the ingenuity to create and make available the facilities with which to work.

This combination of faculties occurs in all physicians, but certainly in different degrees and in different proportions. It accounts for the achievements wrought by the scientific method in all fields of human endeavor. The creative will or "spark" can often be awakened and nurtured by teachers, preceptors, or colleagues. It is perhaps more frequently initiated by an inability to meet or solve the demands of a particular situation or problem that has arisen. The tenacity to find a solution lies within the individual who will not yield to the tempting excuse that "it cannot be done," but who adheres to Danforth's advice, "If it can't be done, just watch the other fellow do it."

The ingenuity, the resourcefulness to obtain and set up facilities with which to carry out a project, is a part of all creative thinking. It can be aided materially and is often made possible by fellowships and instructorships in the universities; through grants from Federal agencies, national and philanthropic organizations; and now by the Picker Foundation.

Mr. James Picker established the Foundation which bears his name to provide the means for radiologists and others to explore and work out their ideas. He believes that important developments will continue to be made in diagnostic radiology and has been concerned by the small number of applications in that field. Just why this should be the case is difficult to understand. The Trustees have circularized leading radiologists throughout the country, seeking explanations and re-

questing constructive suggestions. Certainly a major factor has been a lack of knowledge about the Foundation among the younger radiologists and those in resident training. This is now being overcome by a wider distribution of pamphlets describing the aims and means of the Foundation and the details concerning applications for grants.

There are some who would have us believe that diagnostic radiology is at its zenith—that nothing remains to be done. It seems incredible that a radiologist could hold such a view when the past twenty-five years have witnessed the introduction and perfection of cholecystography, excretory urography, peripheral arteriography and venography, myelography, bronchography, pneumoventriculography and encephalography, all of which were little more than a dream thirty years ago. He who says that the next quarter of a century will not be as fruitful is not fully aware of the creative capacity of the human mind. Problems that are now in the process of development, such as intensifying the fluoroscopic image, will be the accomplishments of tomorrow, and our dreams of today will be the research problems. The intricacies of the liver, spleen, and pancreas, the marrow of the bone, and even perhaps its state of activity, may no longer elude the roentgenogram. The great venous pathways of the abdomen will be demonstrated with ease. X-ray timers will be triggered by radioactive tracers coursing through the arterial channels. Injections of radiopaque contrast chemicals will provoke no uneasiness in the radiologist of the future. The manufacturers will have evolved apparatus which will make today's equipment as obsolete as that of thirty-five years ago. The arthritides, the chondrodystrophies, and the endothelial reticuloses will be understood and many of their unknown characteristics displayed by the roentgen ray. New diseases will be recognized and their manifestations portrayed roentgenographically.

Since the applications for grants from the Picker Foundation are reviewed and recommended by the Committee on Radiology of the National Research Council, they conform to the standards formulated by that organization. As such they offer a reasonable income for the investigators and standard salaries for technical and clerical help. The Council allows a certain latitude in the remuneration for investigators depending on their age, marital status, number of dependents, and their position in civilian life.

This is a progressive attitude, for it acknowledges that most young investigators are married, are raising families, and cannot devote one, two, or three years to pursuing a problem without the means to maintain an adequate standard of living.

Consequently, to promote more applications the Foundation must continue to be generous in recommending the maximum income suggested by the National Research Council. The Committee on Radiology has been alert to its opportunities and has not been overly conservative in approving the applications for grants. The reputation that it is "easy to obtain a grant" is more conducive to encouraging applications than a reputation of its being too "difficult." Likewise, when it becomes known that the Committee will approve applications that carry a risk as well as those that carry a guarantee of success, more applications will be received. Many radiologists have gained the erroneous impression that the Foundation would not be interested in considering grants for the development of new equipment necessary to carry out diagnostic radiographic technics, such as that for body-section radiography, roentgen kymography, or continuous high-speed serialized radiography. The writer has been informed by the founder that such is not the case, and that applications for the development of specialized equipment that will lead to new technics or diagnostic procedures will be welcomed.

It might be helpful for the Committee to formulate and publicize an outline of problems that they consider in need of

exploration and worthy of support. Some of the suggestions might interest and arouse a challenge in a fertile mind.

Furthermore, the Committee recognizes that progress in medicine can be an intricate technologic procedure which can be undertaken and accomplished only by a team of investigators rather than by an individual. For example, a comprehensive study for advancing excretory urography would require teamwork from a radiologist, a urologist, a pharmaceutical chemist, a biochemist, a machinist, and perhaps an electronic engineer. When it becomes known in the large medical centers that the Foundation approves of grants of this nature, more "teams" will be induced to make applications.

Let us remember that the position occupied by diagnostic radiology is not just the result of our own collective efforts. It has been materially abetted by assistance from outside the specialty. The physicist, Roentgen, started us on our way. The physiologist, Cannon, initiated us in the use of contrast media. We have called on the anatomist and pathologist for help as well as helping him. We have to thank the surgeons, Dandy for the introduction of pneumoventriculography and encephalography, and Graham for the long-desired achievement of gallbladder visualization. We are indebted to the internist, Rowntree, for the first intimations suggesting the possibilities of intravenous urography, and to Swick and von Lichtenberg for bringing the procedure into practical use. It was the neurologist, Egas Moniz, who instituted angiography.

Thus, we must recognize that our greatest asset is the daily work which brings us in close co-operation with our colleagues in all the specialties of medicine.

WENDELL G. SCOTT, M. D.

Opening Session of the Fourth Inter-American Congress of Radiology

FOURTH INTER-AMERICAN CONGRESS OF RADIOLOGY

The Fourth Inter-American Congress of Radiology met in Mexico City, Nov. 2 to 8, 1952, under the Presidency of Dr. Manual F. Madrazo. Most of the meetings were held in the Conservatory of Music, which also housed the commercial and scientific exhibits. Radiologists and their wives from the United States attended in the number of 280, about 150 came from the South and Central American countries, a small group from Canada, and a few invited guests from Europe, including Prof. Antoine M. B. Lacassagne of the Paris Radium Institute, Prof. René Gilbert of Geneva, Prof. Georgette J. Melof of Belgium, Dr. M. Lederman of England, and Dr. Guiseppe Barazzetti of Italy. Mexican radiologists brought the total to about 500.

The program included two official themes, or symposiums, on "Radiological Diagnosis of Intra-Abdominal Tumors Other than Gastrointestinal," and "Radiotherapy of the Lymphoblastomas (Lymphosarcomas, Hodgkin's Disease, Leukemias)." In addition there were papers on many timely and interesting topics relating to diagnostic and therapeutic radiology. Important time was devoted to the technic of radiation therapy, including supervoltage roentgen therapy and radioactive cobalt therapy, as well as moving beam therapy. Portal venography, transsacral, mediastinal and perirenal gas insufflation, hysterography and hysteroscopy, obstetric studies, and studies of the pancreas were among the special diagnostic technics considered. Groups of papers were related to the chest, the digestive tract, the bones and joints. Drs. Aebersold, Quimby, Meschan, Fletcher, and others discussed the clinical application of the isotopes.

For most of the sessions, the bilingual presentation of the contributions and the subsequent discussions were highly satisfactory. Particular credit should go to the translators for their immediate and accurate translations of the discussions offered without manuscript.

The social events included a formal opening session, receptions by the Federal Tourist Office and by the Secretary of Foreign Affairs, Sr. Don Manuel Tello.

Group visits were arranged to the new University City, some of the newer residential sections of the capital city, the famous Cathedral, the Archeological Museum, the Pyramids, Taxco and Cuernavaca, and other points of interest. Perhaps the outstanding entertainment was the Exhibition of Mexican Native Costumes, dating back to Aztec days, presented in the Television Centre Theater.

The American College of Radiology had arranged for Dr. Lowell S. Goin and some of the officers of the College to devote an evening of homage to Dr. Manual F. Madrazo, carried out formally with caps and gowns. A large concourse of Dr. Madrazo's friends gathered for the convocation, at which he was invested with the cap and gown of the College and in addition was tendered a scroll attesting the College's pride in his work and the great affection with which he is universally regarded, not only in the United States but throughout the New World.

The closing session of the Congress was a formal meeting of the Inter-American College of Radiology under the Presidency of Dr. Pedro A. Maissa, of Buenos Aires, who was re-elected President of the College. Addresses were made by Dr. Cabello Campos of Brazil and Dr. James T. Case, the latter receiving the Diploma of Honor of the Inter-American College of Radiology. A ball at the Jockey Club ended the Congress.

Dr. J. A. del Regato was named Counsellor of the Inter-American College of Radiology for the United States. It is hoped that radiologists of the United States will feel sufficient interest in furthering inter-American medical fraternal relations to apply to Dr. del Regato, Penrose Cancer Hospital, Colorado Springs, Colorado, for application blanks and information about membership in the organization.

The Fifth Inter-American Congress of Radiology will be held in the United States, in all probability in Washington, D. C., in April 1955, under the Presidency of Dr. James T. Case of Santa Barbara. Dr. L. S. Goin was elected Executive Vice-President, Dr. E. P. Pendergrass, Secretary-General, with Dr. Philip J. Hodes as Secretary for the United States and Canada and Dr. J. A. del Regato as Secretary for Latin America. Dr. Earl E. Barth was elected Treasurer. Plans are already under way for this meeting.

COLORADO RADIOLOGICAL SOCIETY

At a recent meeting of the Colorado Radiological Society, the following officers were elected for the year 1953: Wendell P. Stampfli, M.D., President; Thomas Mahan, M.D., Vice-President; William S. Curtis, M.D., 304 Republic Bldg., Denver, Secretary; Vernon Bolton, M.D., Treasurer.

LOS ANGELES RADIOLOGICAL SOCIETY

At the recent annual election of the Los Angeles Radiological Society, the following officers were chosen for the ensuing year: President, John B. Hamilton, M.D.; Vice-President, Walter L. Stilson, M.D.; Treasurer, M. M. Haskell, M.D.; Secretary, Joseph F. Linsman, M.D., 436 North Roxbury Drive, Beverly Hills; Member of the Executive Committee, Harold P. Tompkins, M.D.

LOS ANGELES MID-WINTER RADIOLOGICAL CONFERENCE

The 5th Annual Mid-Winter Radiological Conference sponsored by the Los Angeles Radiological Society will be held in the Ambassador Hotel, Los Angeles, Calif., on Saturday and Sunday, Feb. 21 and 22, 1953. The out-of-state speakers will be Dr. Fred J. Hodges, Dr. H. Dabney Kerr, and Dr. Ira H. Lockwood. A banquet preceded by cocktails will be held at the Hotel on Saturday evening, February 21. Conference reservations may be made through Dr. M. M. Haskell, 615 Times Bldg., Long Beach 2, Calif. Hotel reservations should be made as soon as possible through the Convention Manager, Ambassador Hotel, Los Angeles. The Conference fee is $20.00, and dinner will be $6.00 per plate.

Courtesy cards are available to radiological residents and radiologists in military service by pre-registration.

MONTANA RADIOLOGICAL SOCIETY

On Sept. 19, 1952, radiologists of Montana, meeting at Missoula, organized the Montana Radiological Society, with Dr. Walter Cox as President and Dr. Grant P. Raitt, Suite 413, Medical Arts Bldg., Billings, as Secretary. The new organization plans to meet at least once annually.

NASSAU RADIOLOGICAL SOCIETY

At a recent meeting of the Nassau Radiological Society (New York) the following resolution was unanimously adopted:

Whereas: Radiology, as practised today, is an essential part of the practice of medicine,

Be it Resolved: That the Nassau Radiological Society protests the inclusion of x-ray studies under Hospital Services in the Associated Hospital Service-Blue Cross contracts.

RADIOLOGICAL HEALTH PROTECTION

A series of three two-week courses in Radiological Health Protection, including technical laboratory procedures, will be presented in Cincinnati, Ohio, commencing Jan. 19, 1953. This program, free of tuition, is offered to qualified applicants by the Public Health Service at its Environmental Health Center. Its purpose is to assist health department employees and key personnel in other governmental or private organizations to achieve a working knowledge of the hazards and problems re-

lated to use of x-rays, radioelements, neutron fluxes, and particle accelerators.

For further information and registration write: Chief, Radiological Health Training Section, Environmental Health Center, 1014 Broadway, Cincinnati 2, Ohio.

DAVID ANDERSON-BERRY PRIZE

A David Anderson-Berry Silver-Gilt Medal, together with a sum of money amounting to about £100, will be awarded during 1953 by the Royal Society of Edinburgh to the person who, in the opinion of the Council, has recently produced the best work on the therapeutic effect of x-rays on human diseases.

Applications for this prize are invited. They may be based on both published and unpublished work and should be accompanied by copies of the relevant papers.

Applications must be in the hands of the General Secretary, Royal Society of Edinburgh, 22 George St., Edinburgh, 2, *not later than March 31, 1953.*

BOOKS WANTED

The following letter, received by Mary E. Adkins, R.T., of the American Society of X-Ray Technicians, has been handed on to RADIOLOGY. We are glad to bring it to the attention of our readers.

"We have a Radiological Section attached to our Hospital. We are very badly in need of good radiological books, journals, etc. Some are available in India and as they are very costly and our funds are very limited, we are unable to purchase them. Further, our institution is a charitable one. Under the circumstances stated above, we request you to kindly help us with some good radiological books and electrotherapy books and also to collect some back copies of the American *X-Ray Technician*, RADIOLOGY, and *American Journal of Roentgenology*, etc., and forward the same to use . . . .

Thanking you very much"

Yours truly,
Dr. T. K. Thomas, Medical Superintendent
St. George's Mission Hospital
Punalur, P. O., Travancore, S. India

Books Received

Books received are acknowledged under this heading and such notice may be regarded as recognition of the courtesy of the sender. Reviews will be published in the interest of our readers and as space permits.

X-RAY DIAGNOSIS OF CHEST DISEASES. By COLEMAN B. RABIN, M.D., Assistant Clinical Professor of Medicine, College of Physicians and Surgeons, Columbia University; Associate Physician for Chest Diseases and Associate Radiologist, Mt. Sinai Hospital, New York; Consulting Physician for Chest Diseases, Beth El Hospital; Senior Consultant for Chest Diseases, Veterans Administration. A volume of 146 pages, with 288 illustrations. Reprinted from Golden's Loose-Leaf Diagnostic Roentgenology, with the same page numbers used in that text. Published by Williams & Wilkins Co., Baltimore, Md., 1952. Price $12.00.

CLINICAL RADIOLOGY OF THE EAR, NOSE AND THROAT. By ERIC SAMUEL, M.D. (Lond.), F.R.C.S. (Eng.), F.F.R. (Lond.), D.M.R.E. (Camb.), Late Hon. Radiologist the Middlesex Hospital, London; Late Radiologist Royal National Ear, Nose and Throat Hospital, London; Lieut.-Col. R.A.M.C., Advisor in Radiology to the Army; Sometime Nuffield Foundation Fellow and Duchess of Bedford Research Fellow, the Middlesex Hospital, London. A volume of 340 pages, with 320 illustrations. Published by Paul B. Hoeber, Inc., Medical Book Department of Harper & Brothers, New York, 1952. Price $13.50.

THE 1952 YEAR BOOK OF RADIOLOGY (JUNE, 1951–JUNE, 1952). RADIOLOGIC DIAGNOSIS, edited by FRED JENNER HODGES, M.D., Professor and Chairman, Department of Roentgenology, University of Michigan, and JOHN FLOYD HOLT, M.D., Associate Professor, Department of Roentgenology, University of Michigan. RADIATION THERAPY, edited by HAROLD W. JACOX, M.D., Professor of Radiology, College of Physicians and Surgeons, Columbia University; Chief, Radiation Therapy Division, Radiologic Service, Presbyterian Hospital, New York City, and VINCENT P. COLLINS, M.D., Professor and Chairman, Department of Radiology, Baylor University, College of Medicine; Radiologist-in-Chief, Jefferson Davis Hospital, Houston, Texas. A volume of 416 pages, with 387 illustrations. Published by the Year Book Publishers, Chicago, Ill., 1952. Price $7.50.

ROENTGEN-DIAGNOSTICS. By H. R. SCHINZ, W. E BAENSCH, E. FRIEDL, and E. UEHLINGER. First American Edition (Based on Fifth German Edition). English translation arranged and edited by JAMES T. CASE, M.D., D.M.R.E., Professor of Radiology Emeritus, Northwestern University Medical School, Chicago. Volume II. Skeleton (Part 2), 1,190 pages, with 1,491 illustrations. Published by Grune & Stratton, New York, N. Y., 1952. Price $45.00.

TERATOMAS. SECTION III, FASC. 9, ATLAS OF TUMOR PATHOLOGY. By RUPERT A. WILLIS, D.Sc., M.D., F.R.C.P., Professor of Pathology, University of Leeds Medical School, Leeds, Eng-

land; Formerly Pathologist to the Alfred Hospital, Consultant Pathologist to the Austin Hospital for Chronic Diseases, and Lecturer on the Pathology of Tumours in the University of Melbourne, Australia; Sir William H. Collins Professor of Human and Comparative Pathology, Royal College of Surgeons, London; Pathologist to the Royal Cancer Hospital, London. A monograph of 58 pages, with 45 illustrations and 1 color plate. Published by the Armed Forces Institute of Pathology, under the auspices of the Subcommittee on Oncology of the Committee on Pathology of the National Research Council, Washington, D. C., 1951. For sale by the American Registry of Pathology, Washington 25, D. C. Price $.50.

TUMORS OF THE PARATHYROID GLANDS. SECTION IV, FASC. 15, ATLAS OF TUMOR PATHOLOGY. By BENJAMIN CASTLEMAN, M.D., Acting Chief, Department of Pathology and Bacteriology, Massachusetts General Hospital, and Assistant Professor of Pathology, Harvard Medical School. A monograph of 74 pages, with 53 illustrations and 3 color plates. Published by the Armed Forces Institute of Pathology, under the auspices of the Subcommittee on Oncology of the Committee on Pathology of the National Research Council, Washington, D. C., 1952. For sale by the American Registry of Pathology, Washington 25, D. C. Price $.65.

TUMORS OF THE CAROTID BODY AND RELATED STRUCTURES. (CHEMORECEPTOR SYSTEM). Section IV, FASC. 16, ATLAS OF TUMOR PATHOLOGY. By PHILIP M. LECOMPTE, M.D., Pathologist, Faulkner Hospital, Boston, Mass., Instructor in Pathology, Harvard Medical School, Boston, Mass. A monograph of 40 pages, with 23 illustrations and 1 color plate. Published by the Armed Forces Institute of Pathology, under the auspices of the Subcommittee on Oncology of the Committee on Pathology of the National Research Council, Washington, D. C., 1951. For sale by the American Registry of Pathology, Washington 25, D. C. Price $.45.

TUMORS OF THE CENTRAL NERVOUS SYSTEM. SECTION X, FASC. 35 AND 37, ATLAS OF TUMOR PATHOLOGY. By JAMES W. KERNOHAN, M.D., Section on Pathologic Anatomy, Mayo Clinic, Rochester, Minn. Professor of Pathology, Graduate School, University of Minnesota, and GEORGE P. SAYRE, M.D., Section on Pathologic Anatomy, Mayo Clinic, Rochester, Minn., Instructor in Pathology, Graduate School, University of Minnesota. A monograph of 130 pages, with 126 illustrations. Published by the Armed Forces Institute of Pathology, under the auspices of the Subcommittee on Oncology of the Committee on Pathology of the National Research Council, Washington, D. C. 1952. For sale by the American Registry of Pathology, Washington 25, D. C. Price $.90.

TUMORS OF THE LOWER RESPIRATORY TRACT. SECTION V, FASC. 17, ATLAS OF TUMOR PATHOLOGY. By AVERILL A. LIEBOW, M.D., Professor of Pathology, Yale University School of Medicine. A monograph of 190 pages, with 249 illustrations. Published by the Armed Forces Institute of Pathology, under the auspices of the Subcommittee on Oncology of the Committee on Pathology of the National Research Council, Washington, D. C., 1952. For sale by the American Registry of Pathology, Washington 25, D. C. Price $1.25.

MODERN RADIOCHEMICAL PRACTICE. By G. B. COOK, Ph.D. (Cantab.), and J. F. DUNCAN, D.Phil. (Oxon.). A volume of 408 pages, with numerous tables, graphs, figures, and plates. Published by the Oxford University Press, Inc., New York 13, N. Y., 1952. Price $8.50.

INFRARED PHOTOGRAPHY IN MEDICINE. By LEO C. MASSOPUST, Sr., Director, Department of Art and Photography, Marquette University School of Medicine, Milwaukee, Wisconsin. Publication No. 152, American Lecture Series. A volume of 54 pages, with 31 illustrations. Published by Charles C Thomas, Springfield, Ill., 1952. Price $2.75.

UROKON SODIUM: PROFESSIONAL INFORMATION. A booklet of 70 pages for the purpose of providing the physician with basic clinical and usage information concerning Urokon® Sodium (30 and 70 per cent) for intravascular radiography. Published by Mallinckrodt Chemical Works, St. Louis 7, Mo.

CORTONE—A HANDBOOK OF THERAPY. A handbook of 130 pages, with numerous illustrations in black and white and in color. Published by Merck & Co., Inc., (Box 22), Rahway, N. J. Available on request, without cost, to physicians and pharmacists.

HARWELL: THE BRITISH ATOMIC ENERGY RESEARCH ESTABLISHMENT, 1946–1951. A volume of 128 pages, with 41 illustrations. Published in England by Her Britannic Majesty's Stationery Office, London, 1952; in United States by the Philosophical Library, New York 16, N. Y.

RADIOLOGICAL SOCIETIES: SECRETARIES AND MEETING DATES

Editor's Note: Secretaries of state and local radiological societies are requested to co-operate in keeping this section up-to-date by notifying the editor promptly of changes in officers and meeting dates.

RADIOLOGICAL SOCIETY OF NORTH AMERICA. *Secretary-Treasurer*, Donald S. Childs, M.D., 713 E. Genesee St., Syracuse 2, N. Y.

AMERICAN RADIUM SOCIETY. *Secretary*, John E. Wirth, M.D., 635 Herkimer St., Pasadena 1, Calif.

AMERICAN ROENTGEN RAY SOCIETY. *Secretary*, Barton R. Young, M.D., Germantown Hospital, Philadelphia 44, Penna.

AMERICAN COLLEGE OF RADIOLOGY. *Exec. Secretary*, William C. Stronach, 20 N. Wacker Dr., Chicago 6.

SECTION ON RADIOLOGY, A. M. A. *Secretary*, Paul C. Hodges, M.D., 950 East 59th St., Chicago 37.

Alabama

ALABAMA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, J. A. Meadows, Jr., M.D., Medical Arts Bldg., Birmingham 5.

Arizona

ARIZONA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, R. Lee Foster, M.D., 15 East Monroe, Phoenix. Annual meeting with State Medical Association; interim meeting in December.

Arkansas

ARKANSAS RADIOLOGICAL SOCIETY. *Secretary*, Fred Hames, M.D., Pine Bluff. Meets every three months and at meeting of State Medical Society.

California

CALIFORNIA MEDICAL ASSOCIATION, SECTION ON RADIOLOGY. *Secretary*, Calvin L. Stewart, M.D., 2330 First Ave., San Diego.

EAST BAY ROENTGEN SOCIETY. *Secretary*, Dan Tucker, M.D., 434 30th St., Oakland 9. Meets monthly, first Thursday, at Peralta Hospital.

LOS ANGELES RADIOLOGICAL SOCIETY. *Secretary*, Joseph F. Linsman, M.D., 436 N. Roxbury Dr., Beverly Hills. Meets monthly, second Wednesday, Los Angeles County Medical Association Bldg.

NORTHERN CALIFORNIA RADIOLOGICAL SOCIETY. *Secretary*, Richard C. Ripple, M.D., 1215 28th St., Sacramento. Meets at dinner last Monday of September, November, January, March, and May.

PACIFIC ROENTGEN SOCIETY. *Secretary*, L. Henry Garland, M.D., 450 Sutter St., San Francisco 8. Meets annually at time of California State Medical Association convention.

SAN DIEGO RADIOLOGICAL SOCIETY. *Secretary*, Rex Uncapher, M.D., 7720 Girard Ave., La Jolla. Meets first Wednesday of each month.

SAN FRANCISCO RADIOLOGICAL SOCIETY. *Secretary*, I. J. Miller, M.D., 2680 Ocean Ave., San Francisco 27. Meets quarterly, at the University Club.

SOUTH BAY RADIOLOGICAL SOCIETY. *Secretary*, Ford Shepherd, M.D., 526 Soquel Ave., Santa Cruz. Meets monthly, second Wednesday.

X-RAY STUDY CLUB OF SAN FRANCISCO. *Secretary*, Charles E. Duisenberg, M.D., Palo Alto Clinic, 300 Homer Ave., Palo Alto. Meets third Thursday at 7:45, January to June at Stanford University Hospital, July to December at San Francisco Hospital.

Colorado

COLORADO RADIOLOGICAL SOCIETY. *Secretary*, Wm. S. Curtis, M.D., 304 Republic Bldg., Denver. Meets monthly, third Friday, at University of Colorado Medical Center or Denver Athletic Club.

Connecticut

CONNECTICUT STATE MEDICAL SOCIETY, SECTION ON RADIOLOGY. *Secretary-Treasurer*, William A. Goodrich, M.D., 85 Jefferson St., Hartford 14. Meets bimonthly, second Wednesday.

CONNECTICUT VALLEY RADIOLOGICAL SOCIETY. *Secretary*, B. Bruce Alicandri, M.D., 20 Maple St., Springfield, Mass. Meets second Friday of October and April.

District of Columbia

RADIOLOGICAL SECTION, DISTRICT OF COLUMBIA MEDICAL SOCIETY. *Secretary*, U. V. Wilcox, M.D., 915 19th St., N.W., Washington 6. Meets third Thursday, January, March, May, and October, at 8:00 P.M., in Medical Society Library.

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FLORIDA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, A. Judson Graves, M.D., 2002 Park St., Jacksonville. Meets in April and in November.

GREATER MIAMI RADIOLOGICAL SOCIETY. *Secretary*, Maurice Greenfield, M.D., Ingraham Bldg., Miami. Meets monthly, third Wednesday, 8:00 P.M., Veterans Administration Bldg., Miami.

Georgia

ATLANTA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Albert A. Rayle, Jr., M.D., 478 Peachtree St. Meets second Friday, September to May.

GEORGIA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Robert M. Tankesley, M.D., 218 Doctors Bldg., Atlanta. Meets in November and at the annual meeting of the State Medical Association.

RICHMOND COUNTY RADIOLOGICAL SOCIETY. *Secretary*, Wm. F. Hamilton, Jr., M.D., University Hospital. Augusta.

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RADIOLOGICAL SOCIETY OF HAWAII. *Secretary*, Col. Alexander O. Haff, Tripler Army Hospital, Honolulu. Meets monthly on the third Friday, at Tripler Army Hospital.

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ILLINOIS RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Stephen L. Casper, M.D., Physicians and Surgeons Clinic, Quincy.

ILLINOIS STATE MEDICAL SOCIETY, SECTION ON RADIOLOGY. *Secretary*, George E. Irwin, Jr., M.D., 427 N. Main St., Bloomington.

Indiana

INDIANA ROENTGEN SOCIETY. *Secretary-Treasurer*, John A. Robb, M.D., 23 East Ohio St., Indianapolis. Annual meeting in May.

Iowa

IOWA X-RAY CLUB. *Secretary*, James McMillen, M.D., 1104 Bankers Trust Bldg., Des Moines. Meets during annual session of State Medical Society, and holds a scientific session in the Fall.

Kansas

KANSAS RADIOLOGICAL SOCIETY. *Secretary*, Willis L. Beller, M.D., 700 Kansas Ave., Topeka. Meets in the Spring with the State Medical Society and in the Winter on call.

Kentucky

KENTUCKY RADIOLOGICAL SOCIETY. *Secretary*, Everett L. Pirkey, M.D., Louisville General Hospital. Meets monthly, second Friday, at Seelbach Hotel, Louisville.

Louisiana

ORLEANS PARISH RADIOLOGICAL SOCIETY. *Secretary*, Joseph V. Schlosser, M.D., Charity Hospital of Louisiana, New Orleans 13. Meets second Tuesday of each month.

SHREVEPORT RADIOLOGICAL CLUB. *Secretary*, W. R. Harwell, M.D., 608 Travis St. Meets monthly September to May, third Wednesday.

Maine

MAINE RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Hugh Allan Smith, M.D., Eastern Maine General Hospital, Bangor. Meets three times a year—Spring, Summer, and Fall.

Maryland

BALTIMORE CITY MEDICAL SOCIETY, RADIOLOGICAL SECTION. *Secretary-Treasurer*, H. Leonard Warres, M.D., 2337 Eutaw Place, Baltimore 17. Meets third Tuesday, September to May.

Michigan

DETROIT X-RAY AND RADIUM SOCIETY. *Secretary*, James C. Cook, M.D., Harper Hospital, Detroit 1. Meets first Thursday, October to May, at Wayne County Medical Society club rooms.

Minnesota

MINNESOTA RADIOLOGICAL SOCIETY. *Secretary*, John R. Hodgson, M.D., The Mayo Clinic, Rochester. Meets in Spring and Fall.

Mississippi

MISSISSIPPI RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, John W. Evans, M.D., 621 High St., Jackson 2, Miss. Meets monthly, third Tuesday, at 6:30 P.M., at the Rotisserie Restaurant, Jackson.

Missouri

RADIOLOGICAL SOCIETY OF GREATER KANSAS CITY. *Secretary*, Sidney Rubin, M.D., 410 Professional Bldg., Kansas City, Mo. Meets last Friday of each month.

ST. LOUIS SOCIETY OF RADIOLOGISTS. *Secretary*, Francis O. Trotter, Jr., M.D., 634 North Grand Blvd., St. Louis 3. Meets on fourth Wednesday, October to May.

Montana

MONTANA RADIOLOGICAL SOCIETY. *Secretary*, Grant P. Raitt, M.D., 413 Medical Arts Bldg., Billings. Meets annually.

Nebraska

NEBRASKA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, James F. Kelly, M.D., 816 Medical Arts Bldg., Omaha. Meets fourth Thursday of each month at 6 P.M. in Omaha or Lincoln.

New England

NEW ENGLAND ROENTGEN RAY SOCIETY. *Secretary*, Stanley M. Wyman, M.D., Massachusetts General Hospital, Boston 14. Meets monthly on third Friday, at the Harvard Club, Boston.

New Hampshire

NEW HAMPSHIRE ROENTGEN SOCIETY. *Secretary*, Albert C. Johnston, M.D., 127 Washington St., Keene.

New Jersey

RADIOLOGICAL SOCIETY OF NEW JERSEY. *Secretary*, Nicholas G. Demy, M.D., 912 Prospect Ave., Plainfield. Meets at Atlantic City at time of State Medical Society and midwinter in Elizabeth.

New York

BUFFALO RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Mario C. Gian, M.D., 610 Niagara St., Buffalo 1. Meets second Monday, October to May.

CENTRAL NEW YORK ROENTGEN SOCIETY. *Secretary*, Dwight V. Needham, M.D., 608 E. Genesee St., Syracuse 2. Meets in January, May, October.

KINGS COUNTY RADIOLOGICAL SOCIETY. *Secretary*, Marcus Wiener, M.D., 1430 48th St., Brooklyn 19. Meets fourth Thursday, October to April (except December), at 8:45 P.M., Kings County Medical Bldg.

NASSAU RADIOLOGICAL SOCIETY. *Secretary*, Joseph J. La Vine, M.D., 259 North Grand Avenue, Baldwin, N.Y. Meets second Tuesday, February, April, June, October, and December.

NEW YORK ROENTGEN SOCIETY. *Secretary*, Harold W. Jacox, M.D., 622 W. 168th St., New York 32.

NORTHEASTERN NEW YORK RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, John F. Roach, M.D., Albany Hospital, Albany. Meets in the capital area second Wednesday, October, November, March, and April. Annual meeting in May or June.

ROCHESTER ROENTGEN-RAY SOCIETY. *Secretary-Treasurer*, Robert J. Bloor, M.D., 260 Crittenden Blvd. Meets at Strong Memorial Hospital, last Monday of each month, September through May.

WESTCHESTER RADIOLOGICAL SOCIETY. *Secretary*, Walter J. Brown, M.D., Northern Westchester Hospital, Mount Kisco, N. Y. Meets third Tuesday of January and October and at other times as announced.

North Carolina

RADIOLOGICAL SOCIETY OF NORTH CAROLINA. *Secretary*, Waldemar C. A. Sternbergh, M.D., 1400 Scott Ave., Charlotte 2. Meets in April and October.

North Dakota

NORTH DAKOTA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, H. Milton Berg, M.D., Quain & Ramstad Clinic, Bismarck. Meets in the Spring with State Medical Association and in the Fall or Winter on call.

Ohio

OHIO STATE RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Willis S. Peck, M.D., 1838 Parkwood Ave., Toledo 2. Meets with State Medical Association.

CENTRAL OHIO RADIOLOGICAL SOCIETY. *Secretary*, Frank A. Riebel, M.D., 15 W. Goodale St., Columbus. Meets second Thursday, October, December, February, April, and June, 6:30 P.M., Columbus Athletic Club, Columbus.

CLEVELAND RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Mortimer Lubert, M.D., Heights Medical Center Bldg., Cleveland Heights 6. Meets at 6:45 P.M. on fourth Monday, October to April, inclusive.

GREATER CINCINNATI RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Harry K. Hines, M.D., 2508 Auburn Ave., Cincinnati 19. Meets first Monday of each month, September to June, at Cincinnati General Hospital.

MIAMI VALLEY RADIOLOGICAL SOCIETY. *Secretary*, W. S. Koller, M.D., 60 Wyoming St., Dayton. Meets monthly, second Friday.

Oklahoma

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Oregon

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Pacific Northwest

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Pennsylvania

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SOUTH CAROLINA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*. Henry E. Plenge, M.D., Spartanburg General Hospital, Spartanburg. Meets with State Medical Association in May.

South Dakota

RADIOLOGICAL SOCIETY OF SOUTH DAKOTA. *Secretary-Treasurer*, Donald J. Peik, M.D., 303 S. Minnesota Ave., Sioux Falls. Meets during annual meeting of State Medical Society.

Tennessee

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TENNESSEE RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, J. Marsh Frère, M.D., Newell Hospital, Chattanooga 2. Meets annually with State Medical Society in April.

Texas

DALLAS-FORT WORTH ROENTGEN STUDY CLUB. *Secretary*, Claude Williams, M.D., Fort Worth. Meets monthly, third Monday, in Dallas odd months, Fort Worth even months.

HOUSTON RADIOLOGICAL SOCIETY. *Secretary*, Frank M. Windrow, M.D., 1205 Hermann Professional Bldg.

SAN ANTONIO-MILITARY RADIOLOGICAL SOCIETY. *Secretary*, Hugo F. Elmendorf, Jr., M.D., 730 Medical Arts Building, San Antonio 5, Texas. Meets at Brook Army Medical Center, the first Monday of each month.

TEXAS RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, R. P. O'Bannon, M.D., 650 Fifth Ave., Fort Worth. Next meeting Jan. 23–24, 1953, San Antonio.

Utah

UTAH STATE RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Angus K. Wilson, M.D., 343 S. Main St., Salt Lake City 1. Meets third Wednesday, January, March, May, September, November.

Virginia

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Washington

WASHINGTON STATE RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, John N. Burkey, M.D., 555 Medical-Dental Bldg., Seattle. Meets fourth Monday, September through May, at College Club, Seattle.

Wisconsin

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UNIVERSITY OF WISCONSIN RADIOLOGICAL CONFERENCE. Meets first and third Thursday at 4 P.M., September to May, Service Memorial Institute.

WISCONSIN RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, W. W. Moir, M.D., Sheboygan Memorial Hospital, Sheboygan.

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LA SOCIÉTÉ CANADIENNE-FRANÇAISE D'ELECTROLOGIE ET DE RADIOLOGIE MÉDICALES. *General Secretary*, Origène Dufresne, M.D., Institut du Radium, Montreal. Meets third Saturday each month.

CUBA

SOCIEDAD DE RADIOLOGÍA Y FISIOTERAPÍA DE CUBA. Offices in Hospital Mercedes, Havana. Meets monthly.

MEXICO

SOCIEDAD MEXICANA DE RADIOLOGÍA Y FISIOTERAPÍA. *General Secretary*, Dr. Dionisio Pérez Cosio, Marsella 11, Mexico, D.F. Meets first Monday of each month.

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SOCIEDAD RADIOLÓGICA PANAMEÑA. *Secretary-Editor*, Luis Arrieta Sánchez, M.D., Apartado No. 86, Panama, R. de P.

PUERTO RICO

ASOCIACIÓN PUERTORRIQUEÑA DE RADIOLOGÍA. *Secretary*, Jesús Rivera Otero, M.D., Box 3542 Santurce, Puerto Rico.

ABSTRACTS OF CURRENT LITERATURE

ROENTGEN DIAGNOSIS

The Head and Neck

VORIS, HAROLD C. Recent Advances in Neurologic Surgery 106

BURGE, CURTIS H. Diagnosis of Intracranial Abnormalities by Arteriography 106

SIMPSON, JAMES R., ET AL. The Role of Cerebral Angiography in the Management of Cerebral Vascular Accidents 106

VORIS, HAROLD C. Use of Serial Angiography in the Diagnosis of Space Occupying Intracranial Lesions 106

BONNAL, J., AND SANTAMARIA, F. Carotid Angiography (Notes Concerning the Localization and Histologic Diagnosis of Cerebral Tumors) 107

RUGGIERO, GIOVANNI. Factors Influencing the Filling of the Anterior Cerebral Artery in Arteriography 107

TER-POGOSSIAN, MICHEL, ET AL. Scintillation Counter for the Diagnosis and Localization of Intracranial Neoplasms 107

CASTELLANO, FRANCESCO, ET AL. Pterional Meningiomas "En Plaque." 108

CHANDY, JACOB, AND ISAIAH, PONNU. Tuberculomas of the Brain 108

RUGGIERO, GIOVANNI, AND CASTELLANO, FRANCESCO. Carotid-Cavernous Aneurysm 108

BRANDT, SVEN, ET AL. Misleading Results of Pneumoencephalography in an Infant with Severe Hypoglycemic Attacks 109

EL GHOLMY, ABDEL AZIM, AND EL SEBAI, BAYOUMI. Hand-Schüller-Christian Syndrome 109

HOLMES, EDGAR M., ET AL. Hemangiomas of the Frontal Bone 109

COHEN, HARRY J., AND WITCHELL, IRA S. Bilateral Congenital Choanal Atresia in Newborn 109

VILSTRUP, GRETHE, AND VILSTRUP, THURE. Does the Utricular Otolithic Membrane Move on Postural Changes of the Head? 109

The Chest

HENTEL, WM., ET AL. Evaluation of Ioduron B in Bronchography. I. A Preliminary Study on Animal Tissues 110

COHEN, M. B., ET AL. Evaluation of Ioduron B in Bronchography. II. A Preliminary Study in Man 110

LENZI, MARIO. Elimination of the Water-Soluble Contrast Medium in Bronchography. "Functional Bronchography." 110

SCARINCI, C. Angiopneumography in Differential Diagnosis 111

PACHECO, CARLOS R., AND DEL CASTILLO, HERMILO. Angiographic Studies After Pulmonary Resection 111

THOMAS, LOUIS B., AND BOYDEN, EDWARD A. Agenesis of the Right Lung 111

TROEN, PHILIP. Explosive Outbreak of an Atypical Pneumonia ("K-8 Fever") 111

RUBIN, ELI H., ET AL. Diffuse Interstitial Fibrosis of the Lungs 112

CHAVES, AARON D., AND ABELES, HANS. Disseminated Nodular Pulmonary Infiltrations of an Indeterminate Nature in Apparently Healthy Persons 112

MAYER, EDGAR, AND RAPPAPORT, ISRAEL. Developmental Origin of Cystic, Bronchiectatic and Emphysematous Changes in the Lungs. A New Concept 113

SHAW, ROBERT R. Localized Hypertrophic Emphysema 113

TEMPLETON, JOHN Y., III. Bronchial Obstruction with Chronic Atelectasis and Pneumonitis Due to Hilar Lymphadenitis After Lobectomy and Lingulectomy 113

DUNHAM, H. H., AND SMITH, V. G. Terminal Bronchiolar or "Alveolar Cell" Carcinoma of the Lung 114

GOLDBERG, JACOB, ET AL. Coexistent Bronchogenic Carcinoma and Active Pulmonary Tuberculosis. Report of Five Cases with Autopsy Findings 114

DENNIS, JOHN M., ET AL. Pulmonary Adenomatosis 114

MONOD, OLIVER, ET AL. Bronchiectatic Aspergillosis 115

CASTILLO, JUAN J. Bronchial Onset of Reinfection Tuberculosis in the Adult 115

SUTER, F., AND ISELIN, H. Has Tuberculous Lymph Node Perforation in Adults Practical Significance? 115

DICKEY, LLOYD B. Primary Pulmonary Tuberculosis as a Cause of Bronchiectasis in Children 115

VEENEKLAAS, G. M. H. Cause and Sequelae of Intrapulmonary Shadows in Primary Tuberculosis 115

ACKERMAN, ALFRED J., AND MOYER, JOHN H. Streptomycin in Pulmonary Tuberculosis: Clinico-Roentgenological Consideration 116

ANDERSON, ROBERT J. Review of Mass Chest X-Ray Surveys 116

SMITH, ADELAIDE R. Pleural Calcification Resulting from Exposure to Certain Dusts 117

SLAVIN, PAUL. Diffuse Pulmonary Granulomatosis in Young Women Following Exposure to Beryllium Compounds in the Manufacture of Radio Tubes 117

BLUEFARB, SAMUEL M., AND STEINBERG, HYMAN S. Pulmonary Manifestations of Mycosis Fungoides 117

BASS, HYMAN E., ET AL. Pulmonary Changes in Uremia 117

SANSONE, G., AND DE MAESTRI, A. Simultaneous Visualization of the Posterior and Anterior Mediastinum After Insufflation in the Peridural Space. Tridimensional Tomographic Study ... 118
WILLIAMS, MARK H., AND JOHNSON, JAMES F. Mediastinal Gastric Cyst. Successful Excision in an Eight-Week-Old Infant ... 118
BETOULIÈRES, P., AND PALEIRAC, R. Some Radiologic Aspects of the Thymus ... 118
MAIER, HERBERT C. Transthoracic Removal of Calcified Lymph Node Causing Hemoptysis by Bronchial Erosion ... 119
SANTY, P., ET AL. Six Cases of Cystic Pulmonary Sequestration with Abnormal Artery of Aortic Origin ... 119
ZAKY, HALIM A. Aneurysm of the Pulmonary Artery Due to Schistosomiasis ... 119
CHARBON, BERNARD C., ET AL. Surgical Treatment of Multiple Arteriovenous Fistulas in the Right Lung in a Patient Having Undergone a Left Pneumonectomy Seven Years Earlier for the Same Disease ... 119
RUSHMER, ROBERT F., AND THAL, NATHAN. Factors Influencing Stroke Volume: A Cinefluorographic Study of Angiocardiography ... 120
DACK, SIMON, AND PALEY, DAVID H. Electrokymography. I. The Ventricular Electrokymogram. II. The Great Vessel and Auricular Electrokymograms ... 120
SWAN, HENRY, ET AL. Foreign Bodies in the Heart. Indications for and Technic of Removal with Temporary Interruption of Cardiac Blood Flow ... 121
PORTE, DANIEL. Detection of Heart Disease in a Mass Chest X-Ray Survey for Tuberculosis Case-Finding ... 121
BOSTOCK, M. I., AND MORRIS, WILLIAM. Heart Disease and Mass Miniature Radiography ... 121
JACOBSON, HAROLD G., ET AL. Left Atrial Enlargement. The Optimum Roentgen Method for Its Demonstration ... 122
HABBE, J. E. Detection and Identification of Intracardiac Calcifications ... 122
GERNEZ-RIEUX, ET AL. Radiographic Images of an Intracardiac Gas Embolus ... 122
SLATER, S. R. ET AL. Constrictive Pericarditis Caused by Solitary Metastatic Carcinoma of the Pericardium and Complicated by Radiation Fibrosis of the Mediastinum ... 122

The Spinal Cord

LOVE, J. GRAFTON, AND DODGE, HENRY W., JR. Dumbell (Hourglass) Neurofibromas Affecting the Spinal Cord ... 123

The Digestive System

BUGDEN, WALTER F. Spontaneous Rupture of Thoracic Esophagus: Its Surgical Cure ... 123
WEISS, GERALD N., AND MIANGOLARRA, C. J. Tracheoesophageal Fistula: Value of Immediate Diagnosis, with Report of a Case ... 123
SARASIN, R., AND HOCH, A. Invagination of the Mucous Membrane of the Esophagus into the Stomach ... 123
ALBOT, GUY. Pharmaco-radiography of the Stomach and Duodenum ... 124
LOLLI, GIORGIO, ET AL. Influence of Carbonated Water on Gastric Emptying ... 124
PIRKEY, EVERETT L., ET AL. "Profile Line" in Roentgenologic Differentiation of Intrinsic and Extrinsic Lesions of the Stomach ... 124
PORTIS, SIDNEY A., AND KING, JOSEPH C. The Gastrointestinal Tract in the Aged ... 125
BERRIDGE, F. R., AND PRIOR, KATHLEEN M. Radiological Studies of the Alimentary Tracts of Undernourished German Children ... 125
PERSKY, LESTER, AND FRANK, EDWARD D. Foreign-Body Perforations of the Gastrointestinal Tract ... 125
WALTHER, O. Contributions to the Differential Diagnosis of Tumors Along the Greater Curvature of the Stomach ... 125
ELLIOTT, GLADDEN V., AND WILSON, HUGH M. Mesenchymal Tumors of the Stomach ... 125
SWYNNERTON, B. F., AND TRUELOVE, S. C. Carcinoma of the Stomach ... 126
FISHER, EDWIN R., AND BROWN, CHARLES H. Linitis Plastica Carcinoma of the Stomach with Extensive Metastases Simulating a Colonic Lesion ... 126
YARNIS, HARRY, ET AL. Gastric Polyps ... 127
GAMBACCINI, PIERO. Radiologic, Operative, and Pathological Findings in a Series of Cases of Gastric Polyp ... 127
YOUNG, BARTON, R., AND SCANLAN, ROBERT L. Demonstration and Significance of the Pedicle in the Roentgen Diagnosis of Polypoid Tumors of the Alimentary Tract ... 127
OBERHOLZER, J. Significance of Postoperative Examinations Following Partial Gastrectomy and Gastroenterostomy ... 127
LEB, A. Roentgen Study of the Resected Stomach with Albumin and Fat Barium Tablets (A Roentgen Test of Digestion) ... 128
FRIEDMAN, A. I. Gastric Ulcer with Multiple Gastro-intestinal Diverticula ... 128
RECHNITZER, P. A., AND GEDDES, J. H. Twenty-six Cases of Asymptomatic Duodenal Ulcer. 128
HENDERSON, SAMUEL G. Roentgenologic Diagnosis of Peptic Ulcer, with Special Reference to Percentage Incidence of Duodenal Ulcer in Routine Gastrointestinal Examinations ... 128
SAMUEL, ERIC. Post-Bulbar Duodenal Ulcers ... 129
SHRUM, RICHARD C. Duodenal Obstruction Due to Pressure of Superior Mesenteric Vessels ... 129
DEUCHER, W. Mucosal Relief Study of Small Intestine ... 129
HUSEBYE, O. W. Roentgenological Examination and Treatment of Chronic Jejunitis ... 130
GOLDEN, ROSS. Functional Obstruction of Efferent Loop of Jejunum Following Partial Gastrectomy ... 130

BYRNE, JOHN J., ET AL. Volvulus of the Cecum.. 130
DEMUTH, WILLIAM E., JR., ET AL. Adenomatous Polyps of the Colon and Rectum: A Challenge in Cancer Prophylaxis..... 130
LEVINE, ROBERT M., AND RIPSTEIN, CHARLES B. Diagnosis and Surgical Management of Gall Stone Ileus..... 131
SILVIS, RICHARD S. Annular Pancreas..... 131
KATZ, HILLIARD J., AND WILLIAMS, A. JUSTIN. Accessory Lobes of Liver and Their Significance in Roentgen Diagnosis..... 131
BÍLEK, FRANTIŠEK. The Shadow of the Liver, Right Kidney and Soft Parts in Cholecystography..... 132
RUSSO, P. E., AND CAVANAUGH, C. J. The Gallbladder: Comparison of Roentgen and Pathologic Findings..... 132
LEVIN, GERSHON J. Cholelithiasis Not Recognized by Cholecystogram..... 132
MARTIN, FRANCIS, AND MASSIMIANO, ANTONIO G. The Nonvisualized Gall Bladder..... 132
JANKELSON, I. R., AND O'CONNER, J. J. Spontaneous Cholecystoduodenostomy..... 133
KANE, CHARLES F., ET AL. Papilloma of the Gallbladder. Report of Eight Cases..... 133
PARTINGTON, PHILIP F. Fibrotic Stenosis of the Terminal Common Duct..... 133
BENNETT, H. STANLEY, AND COLLINS, E. N. Oil Granuloma of the Peritoneum..... 134

The Musculoskeletal System

SMITH, EDWARD B., ET AL. Gargoylism (Dysostosis Multiplex)..... 134
LAVINE, LEROY S., AND KOVEN, MORRIS T. Engelmann's Disease (Progressive Diaphyseal Dysplasia)..... 135
BESKIN, CHARLES A., AND ATWOOD, WARREN G. Peripheral Bone Metastasis from Carcinoma of the Rectum..... 135
MYERS, GORDON B., ET AL. Joint and Skeletal Muscle Manifestations in Sarcoidosis..... 135
COCCHI, UMBERTO. Hepatogenous Osteoporosis. 135
HILDING, A. C. Syndrome of Joint and Cartilaginous Pathologic Changes with Destructive Iriodocyclitis: Comparison with Described Concurrent Ear and Joint Diseases..... 135
BIERMAN, HOWARD R., ET AL. Ameliorative Effect of Antibiotics on Nonlipoid Reticuloendotheliosis (Letterer-Siwe Disease) in Identical Twins..... 136
BINGOLD, A. C. Coexistence of Polyostotic Fibrous Dysplasia and Juvenile Tabes..... 136
PURCELL, HOWARD M., ET AL. Osteoid Osteoma in Childhood..... 136
COLVER, THOMAS, AND LODGE, THOMAS. Accelerated Ossification in a Cretin Caused by High Thyroid Dosage..... 136
HASNER, E., ET AL. Roentgenologic Examination of the Function of the Lumbar Spine..... 137
BUETTI, C. Roentgen Examination of the Cervical Spine of Swingers and Wrestlers..... 137
LOMBARDI, GUIDO. Radiologic Diagnosis of Spinal Tumors. Seventy Cases..... 137
GARDNER, W. JAMES, ET AL. X-Ray Visualization of the Intervertebral Disk, with a Consideration of the Morbidity of Disk Puncture..... 137
WILSON, JAMES N., AND ILFELD, FREDERIC W. Manipulation of the Herniated Intervertebral Disc..... 138
MERCHANT, FREDERICK T. Solitary Myeloma of Rib Simulating Mediastinal Tumor..... 138
MITCHELL, J. B. Cough Fracture..... 138
WYNN-WILLIAMS, N. Cough Fracture of the Ribs Unassociated with Pulmonary Tuberculosis. 139
RAPP, IRA H. Adolescent Coxa Vara: Clinical Considerations and Aspects of Treatment... 139
KEATS, THEODORE E., ET AL. Pneumoarthrography of the Knee..... 139
ESSEX-LOPRESTI, PETER. Mechanism, Reduction Technique, and Results in Fractures of the Os Calcis..... 139
HÄUPTLI, O. Plaster Plombage to Fill Missing Bone Structure..... 140

Gynecology and Obstetrics

ROZIN, SAMUEL. X-Ray Diagnosis of Genital Tuberculosis..... 140
COE, FRED O. Roentgenographic Cephalopelvimetry..... 140

The Genitourinary System

BERRY, N. E., ET AL. Abdominal Aortography in Urology..... 141
BERG, OWEN C., AND ALLEN, DAVID H. Use of Carbonated Beverage as an Aid in Pediatric Excretory Urography..... 141
LEVINE, BERNARD. Use of Helium in Perirenal Insufflation..... 141
ROSS, JAMES A. Studies in Pyelorenal Backflow. 141
MOORE, THOMAS. Ectopic Openings of the Ureter 141
MORLEY, HAROLD V., ET AL. Intussusception of the Ureter Associated with a Benign Polyp.. 142
EDLING, NILS P. G. Roentgen Diagnosis of the Diseases of the Prostate..... 142
BOONE, ALEX W. Cysto-Urethrograms Before Prostatectomy..... 143
MARUŠIAK, JIŘÍ. Calculosis of the Seminal Vesicles..... 143

The Blood Vessels

LOOSE, K. E. Arterography: Serial Arteriography; Translumbar and Subdiaphragmatic Aortography..... 143
WILKIE, JOHN. Radiology in Peripheral Arterial Disease..... 143
RABAIOTTI, ANTONIO. Value of and Indications for Endosseous Phlebography for Study of Venous Disturbances of Lower Limb. Phlebography by Puncture of Os Calcis..... 144
DREYER, B., AND BUDTZ-OLSEN, O. E. Splenic Venography: Demonstration of the Portal Circulation with Diodone..... 144

ELLIOTT, ROBERT V., AND PECK, MORDANT E. Thrombotic Occlusion of Aorta as Demonstrated by Translumbar Aortograms..... 144

Special Diagnostic Problems

WALTHER, HANS E. Simultaneous Occurrence of Malignant Tumors and Systemic Diseases.. 144
PACK, GEORGE T., AND ARIEL, IRVING M. Fibrosarcoma of the Soft Somatic Tissues: A Clinical and Pathologic Study..... 144

Technic; Apparatus

WACHSMANN, F., ET AL. Fundamentals and Examples of Hard-Ray Technic..... 145
DORENBUSCH, ALFRED A., AND ROBERTS, WENDELL E. Bronchoscopic Removal of a Foreign Body with the Aid of Triangulation Roentgenoscopy..... 145
BRANDT, J. LEONARD, ET AL. The Tricardiograph: A Rapid Screening Method for Cardiac Disease..... 146
ROSENMAN, LEONARD D., ET AL. A New Injection Device for Angiography..... 146
LENZI, MARIO. Some Information Concerning a New X-Ray Tube (Polyanodic Tube)..... 146
ROSS, MILTON S. Measuring and Centering Device for Use on X-Ray Machine..... 146
POWELL, NORBORNE B. Reproduction of X-Rays on 35 mm. Film..... 146
GERSHON-COHEN, J., ET AL. Telognosis. Three Years of Experience with Diagnosis by Telephone-Transmitted Roentgenograms... 146

ROENTGEN AND RADIUM THERAPY

MARTIN, CHARLES L., AND CRAFFEY, EDWARD J. Cancer of the Gums..... 147
POLLACK, ROBERT S. Cylindroma in Nose and Sinuses..... 147
CAULK, R. M. Roentgen Therapy in Cancer of the Larynx and Hypopharynx..... 147
CLARKE, T. HOWARD. Parotid Gland Tumors... 148
KOHLER, A. Ten Years of Preoperative Radiation Therapy of Breast Carcinomas..... 148
VERNÁR, HUGO. Treatment of Ulcerating Carcinoma of the Breast..... 148
BAUER, R., AND HARTWEG, H. Experiences and Results of Roentgen Therapy of Bronchial and Lung Cancer, Respectively..... 148
DELARIO, A. J. Carcinoma of the Esophagus.... 149
GARCIA, MANUEL. The Curability of Carcinoma of the Cervix in the Negro..... 149
HAHN, GEORGE A. Primary Carcinoma of the Female Urethra..... 149
HAUBRICH, R. Radiation Therapy and Prognosis of Lymphogranulomatosis..... 150
MURPHY, EDWARD S., ET AL. Neurogenic Sarcoma Treated by Surgery and Radiotherapy. 150
PFAHLER, GEORGE E. Treatment of Birthmarks with Special Consideration of Cavernous Hemangioma..... 150
LOCH, WALTER E., AND FISCHER, NEWTON D. Nasopharyngeal Radium Treatment: A Follow-up of 263 Patients..... 151

Technic

COHEN, OSCAR H., AND PALAZZO, WILLIAM L. The Grid Technique of Radiotherapy with Depth Dose Measurements..... 151
JACOBSON, LILLIAN E., AND LIPMAN, ANSEL. Depth Dose Investigation for Perforated Grid Therapy at 200 Kilovolts..... 151
HLASIVEC, ZDENĚK. Clinical Experiences with Teleradium Apparatus Containing 3 Grammes of Radium Equivalent..... 152

RADIOISOTOPES

MAYNEORD, W. V. Radiography of the Human Body with Radioactive Isotopes..... 152
STRAUB, CONRAD P. Effect of Radioactive Materials on Environmental Health..... 152
ROSWIT, BERNARD, ET AL. Evaluation of Diagnostic Methods in Diseases of Thyroid Function, with Particular Reference to Radioiodine Tracer Tests..... 153
FOOTE, J. B., ET AL. Comparison of Radioactive and Metabolic Methods of Investigating Thyroid Function..... 153
KASS, IRVING. Studies on the In Vitro Effects of Radioactive I^{131} Labeled 3,5 Diiodo PAS on the Tubercle Bacillus..... 153
OSGOOD, EDWIN E., ET AL. Relative Rates of Formation of New Leukocytes in Patients with Acute and Chronic Leukemias Measured by the Uptake of Radioactive Phosphorus in the Isolated Desoxyribosenucleic Acid..... 154
THOMAS, CHARLES I., ET AL. Detection of Intraocular Tumors with Radioactive Phosphorus: Preliminary Report with Special Reference to Differentiation of the Cause of Retinal Separation..... 154
ODEBLAD, ERIK. Contribution to the Theory and Technique of Quantitative Autoradiography with P^{32}, with Special Reference to the Granulosa Tissue of the Graafian Follicles in the Rabbit..... 154
MOSES, CAMPBELL, ET AL. Toxicity of Radioiodine and Radiophosphorus in Rats in Doses Comparable to Those Used Clinically..... 154
JOHNS, H. E. Physical Characteristics of Radiation in Cobalt^{60} Beam Therapy..... 155
WATSON, T. A. Clinical Possibilities of the Cobalt^{60} Beam Unit..... 155
DIXON, W. R., ET AL. Room Protection Measurements for Cobalt^{60} Teletherapy Units..... 155
SMITH, IVAN H. Cobalt^{60} Beam Therapy: Some Influences and Advantages..... 155
GREEN, D. T., AND ERRINGTON, R. F. Considerations in the Design of a Cobalt^{60} Beam Therapy Equipment..... 156

BESSLER, W., AND MEISTER, TH. Endovesical Irradiation of Tumors of the Bladder with Radioactive Cobalt 156
GOLDIE, HORACE, ET AL. Effect of Colloidal Au^{198} on the Growth Cycle of Leukemic Cells and on the Survival of Their Host 156
BOTHWELL, T. H., ET AL. Cardiac Complications of Hemochromatosis. Report of a Case Including Radioiron Studies and a Note on Etiology 157
DOUGLAS, D. M., ET AL. Clearance of Radiosodium from the Subcutaneous Interstitial Fluid of the Limb 157
SWEET, WILLIAM H., AND JAVID, MANUCHER. The Possible Use of Neutron-Capturing Isotopes Such as $Boron^{10}$ in the Treatment of Neoplasms. I. Intracranial Tumors 157

RADIATION EFFECTS

KAHN, REUBEN L., ET AL. Effect of Irradiation on the Universal Reaction in Cancer 157
KAHN, REUBEN L., ET AL. Effect of Irradiation on the Universal Reaction in Polycythemia Vera 158
VON MOOS, F. Sarcoma of the Skin Following Roentgen Irradiation 158
VERNÁR, H., AND ŠÁRI, A. Carcinomatous Metastases in the Skin Histologically Suspicious of Tuberculosis 158
CARTER, BAYARD, ET AL. Vesicovaginal Fistulas. 158
NORMAN, OLOF. Hysterographically Visualized Radionecrosis Following Intra-Uterine Radiation of Cancer of the Corpus of the Uterus. 158
POINTON, R. C. S., AND SMITH, T. B. Fractures of Neck of Femur Following Irradiation of the Pelvis 159
GREELEY, PAUL W. Reconstruction of Injuries Following Excessive Radiation Therapy 159
SMITH, WILLIE W., ET AL. Body Weight, Fasting and Forced Feeding After Whole Body X-Irradiation 159
BETZ, H. Role of the Adrenal in the General Resistance of the Organism to Radiations 159
EDELMANN, ABRAHAM, AND KATSH, SEYMOUR. Survival of Rats Adrenalectomized After X-Irradiation 160
GRAY, JOHN L., ET AL. Protective Effect of Pitressin and of Epinephrine Against Total Body X-Irradiation 160
HALEY, THOMAS J., ET AL. Presence and Identity of Vasotropic Substances in Blood of Rats Subjected to Acute Whole Body Roentgen Ray Irradiation 160
KAPLAN, HENRY S., AND BROWN, MARY B. Mortality of Mice After Total-Body Irradiation as Influenced by Alterations in Total Dose, Fractionation, and Periodicity of Treatment 160
BOURDEAU, ROBERT, AND LAUFMAN, HAROLD. Local Hemostasis in the Hemorrhagic Syndrome of Irradiation 161
WILSON, JAMES G., ET AL. Neoplasia Induced in Rat Embryos by Roentgen Irradiation 161
VON ESSEN, CARL F., AND KAPLAN, HENRY S. Further Studies on Metastasis of a Transplantable Mouse Mammary Carcinoma After Roentgen Irradiation 161
HOLLCROFT, JOANNE W., ET AL. Factors Modifying the Effect of X-Irradiation on Regression of a Transplanted Lymphosarcoma. 161
VON SALLMANN, LUDWIG. Experimental Studies on Early Lens Changes After Roentgen Irradiation. III. Effect of X-Radiation on Mitotic Activity and Nuclear Fragmentation of Lens Epithelium in Normal and Cysteine-Treated Rabbits 162
FOGG, LLOYD, C., AND COWING, RUSSELL F. Post-Irradiation Studies on Mammalian Testes ... 162
BRUNST, V. V., ET AL. Influence of Local X-ray Treatment on Development of Jaws in Young Axolotl (Siredon mexicanum) 162
READ, JOHN. Effect of Ionizing Radiations on the Broad Bean Root. Part X. Dependence of the X-Ray Sensitivity on Dissolved Oxygen. 163
KEPP, RICHARD K., AND MÜLLER, KURT. Physical Explanation of Different Effects of the Time Factor on Biological Objects 163
HALEY, THOMAS J., ET AL. Identification of Ferritin in Blood of Dogs Subjected to Radiation from an Atomic Detonation 163
OLIPHANT, MARCUS. Radiation Hazards of Atomic Energy 163
LYON, GEORGE M. Medical Problems in Atomic Exposure 163

ROENTGEN DIAGNOSIS

THE HEAD AND NECK

Recent Advances in Neurologic Surgery. Harold C. Voris. S. Clin. North America **32**: 217–232, February 1952.

This article presents a full discussion of the various recent advances in neurologic surgery. It is divided into two main sections: diagnostic aids and advances in treatment.

Angiocardiography has proved to be of great value in the localization and evaluation of aneurysms and space-occupying lesions. It is done by the percutaneous method, with puncture of both the carotid and vertebral arteries. Serial angiography as a means of diagnosing intracranial tumors is well recognized. Carotid angiography is indispensable for the recognition of intracranial aneurysms of the saccular type. As compared to ventriculography and encephalography, angiography offers the advantages of relative safety, absence of discomfort, and demonstration of the arterial supply and venous drainage, which is frequently invaluable in planning surgical atatck.

It is believed that the use of radioactive isotopes will be of great value in the diagnosis and localization of brain tumors when the cost to the patient and the variability in the results have been overcome. Other methods of diagnosis, including electroencephalography and electromyography, are briefly considered.

Recent advances in treatment include the use of antibiotics and chemotherapy, improved methods in the care of paraplegics, and modifications of surgical technic in the treatment of hydrocephalus. Psychosurgery is mentioned, for the alteration or improvement of abnormal functions of nervous tissue. Lobotomy for the relief of pain appears to be of great value.

Eleven roentgenograms. A. Wilson Brown, M.D.
Shreveport (La.) Charity Hospital

Diagnosis of Intracranial Abnormalities by Arteriography. Curtis H. Burge. South. M. J. **45**: 137–138, February 1952.

The greatest usefulness of intracranial arteriography is in the diagnosis of vascular lesions, but it can also be employed in the diagnosis of cerebral neoplasms. A rapid serialograph will show the injection in all its phases, but good anterior, posterior, and lateral films are sufficient for diagnostic purposes.

The vascular lesions include saccular aneurysms, congenital arteriovenous malformations, traumatic arteriovenous fistulas, and vascular occlusions and coarctation. Arteriography usually indicates the presence of cerebral neoplasms by vascular displacement, but certain tumors may produce a characteristic vascular pattern which makes it possible to recognize their type before craniotomy. Meningiomas, for example, can often be diagnosed by arteriography, and about 40 to 50 per cent of glioblastomas produce a diagnostic vascular pattern. With encephalography, ventriculography, and arteriography used in conjunction, a high degree of accuracy is possible in the diagnosis of intracranial lesions. Arteriography is not reliable in the diagnosis of tumors of the ventricular system, basal ganglia, midbrain, and posterior fossa.

The author states that a search for an aneurysm should not be concluded until both carotids and one vertebral artery are injected. He points out that injection of the vertebral arteries is difficult by the open method but relatively simple by the percutaneous technic.

In the Discussion following the paper, Dr. Frederick C. Rehfeldt describes briefly a prolonged exposure technic suggested by O'Bannon, which has resulted in fewer instances of non-filling and a real improvement in the extent of filling of the cerebral vessels.

John M. Kohl, M.D.
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The Role of Cerebral Angiography in the Management of Cerebral Vascular Accidents. James R. Simpson, Exum Walker, and William W. Moore. J. M. A. Georgia **41**: 55–58, February 1952.

Since advances have been made in the therapy of the various conditions grouped under cerebral vascular accidents, it is important to know early in the course of the illness which one of the various possibilities is present. The authors state that cerebral angiography [we cannot agree with them that the procedure is a "minor diagnostic procedure"] has its most common indication in spontaneous subarachnoid hemorrhage, which when treated conservatively carries a high mortality rate. This condition must be differentiated from cerebral thrombosis and, in making the distinction between the two, cerebral angiography becomes the first step in definitive treatment. It is also of great diagnostic aid in other conditions, among which are vascular tumors and malformations, arteriovenous fistulas, brain tumors, and craniocerebral injuries.

A brief review of the literature and technic is given, and 7 cases are illustrated. Unfortunately, each case is represented by a single film, and little more than the diagnosis is given. Most, if not all, of the cases fail to fit the picture ordinarily thought of when the title is read (3 of the 4 patients whose ages are given were twenty-five years old or younger; one of the lesions was a subdural hematoma, another a subarachnoid hemorrhage without any localizing signs, etc.).

The reproductions of the angiograms are good, with adequate contrast and clarity.

Fifteen roentgenograms. Zac F. Endress, M.D.
Pontiac, Mich.

Use of Serial Angiography in the Diagnosis of Space Occupying Intracranial Lesions. Harold C. Voris. Am. J. Roentgenol. **67**: 361–374, March 1952.

The author reports 11 cases in which serial carotid and vertebral angiography were used in the diagnosis and localization of intracranial space-occupying lesions. The method of study was the conventional one, with a percutaneous technic. Two or more injections of 10 c.c. of 35 per cent Diodrast were given, and a series of six films were exposed during four and a half seconds.

Certain advantages of angiography over air studies are listed. Angiography is relatively safer, especially in patients with increased intracranial pressure. Discomfort is relatively less. The author believes that angiography affords more exact localization of a neoplasm and considers a correct pathologic diagnosis more likely than with ventriculography. From the surgical point of view it is of great importance to have a knowl-

edge of the arterial supply and venous drainage of a neoplasm. This information cannot be obtained except by angiography.

Eleven case reports are included, with 30 roentgenograms.

W. L. BRIDGES, M.D.
Indiana University

Carotid Angiography (Notes Concerning the Localization and Histologic Diagnosis of Cerebral Tumors). J. Bonnal and F. Santamaria. J. de radiol. et d'électrol. **33:** 136–146, 1952. (In French)

Angiography of the carotid artery is indicated for the diagnosis of vascular malformations, thromboses, subdural hematomas, and cerebral tumors. The contrast medium of choice has been a 35 or 50 per cent solution of diiodo-3, 5-pyridone-4 N-acetate of diethanolamine, known in America as Diodrast, in Scandinavian countries as Umbradil, and in France as Diodone. It has been shown, however, that repeated injections of even this relatively safe medium at short intervals may be dangerous and that latent vascular lesions may become manifest following its introduction.

Whether the open or percutaneous method be used, it is important to traumatize the arterial wall as little as possible in order to avoid spasm and thromboembolic phenomena. If a minimal amount, about 10 c.c., of Diodrast is employed, there are scarcely any contraindications (not even hypertension or renal lesions) except idiosyncrasy. In the latter case, if angiography is indispensable, Thorotrast may be used.

The authors have performed 260 studies, basing their present report on 57 patients with cerebral tumors, of which 32 have been verified surgically and histologically.

Localization of tumors is indicated by vascular displacement and abnormal vascularization. Tumoral vessels aid localization but unfortunately are not depicted in over half the cases. The following sites are suggested: frontal (premotor), rolandoparietal, temporal, occipital, and central.

In a profile view *frontal tumors* may be seen to depress the carotid siphon and the first part of the sylvian group, and push the ascending frontoparietal artery (candelabra) posteriorly. In the anteroposterior or frontal view, the anterior cerebral artery is displaced toward the uninvolved side. In posterior frontal tumors this latter displacement is limited by the frontopolar artery (positive frontopolar sign of Fisher).

Rolando-parietal tumors depress the siphon, depress and elongate the sylvian vessels, and depress or push forward portions of the callosomarginal and pericallosal vessels. In the anteroposterior view, the anterior cerebral and its branches may show displacement toward the opposite side, especially with more anteriorly situated tumors. A small parasagittal tumor may be surrounded by considerable edema, thus leading to pronounced vascular displacement.

Anterior temporal lobe tumors elevate the first portion of the sylvian group and displace it medially, as noted in the anteroposterior view. The anterior cerebral artery is also dislocated toward the opposite side. *Posterior temporal tumors* displace the more posterior portions of the sylvian vessels and are less likely to cause any pronounced displacement of the anterior cerebral artery.

Occipital tumors displace the posterior terminals of the middle and anterior cerebral branches. If the posterior cerebral is filled, localization may be made easier by noting depression of the terminal portion of this vessel.

Central tumors cause more difficulty in accurate localization, and for this group air studies may be useful. Tumors of the chiasmatic region may displace the siphon. Gliomas of the corpus callosum may displace the pericallosal artery, and elevation of the inferior sagittal sinus may be noted in the venogram. Ventricular and posterior fossa tumors produce hydrocephalus and thus cause elongation of the sylvian vessels and elongation and arcing of the anterior cerebral artery.

Vascularization of tumors varies with the histologic pattern. Glioblastomas often display abundant irregular vessels, with abnormal arteriovenous communications. Metastatic tumors have an abundant vascular supply and are often difficult to differentiate from glioblastoma. The presence of a known primary lesion, as in the lung or kidney, or of multiple lesions, may be of aid. Meningiomas have a fine vascular network, best seen in the capillary or venous phase as a "stain"; they may have small efferent veins at the periphery and may be supplied by both internal and external carotid systems. Other tumors, cysts, and abscesses usually have no characteristic vascular supply but may cause vascular displacement.

Eleven roentgenograms; 10 drawings, including diagrams of the normal arteriogram and venogram.

CHARLES M. NICE, M.D.
University of Minnesota

Factors Influencing the Filling of the Anterior Cerebral Artery in Arteriography. Giovanni Ruggiero. Acta radiol. **37:** 87–95, February 1952.

This is a review of 231 cases to corroborate or correct the various theses offered for failure of visualization of the anterior cerebral artery by angiography.

For valid studies, rapid percutaneous injection into the internal carotid artery was found to be necessary. The needle point had to be free. Umbradil was used as the contrast medium. Anteroposterior as well as lateral views were required. These were supplemented by exposures with the opposite carotid artery under pressure, thereby reducing the pressure within the cranium on that side. The roentgenograms must permit thorough analysis of every part of the anterior communicating artery from its origin in the carotid artery up to the pericallosal artery.

The use of the above procedure gave evidence of variable congenital anomalies of the anterior cerebral artery and the anterior communicating artery in 20 per cent of the series studied. This corresponds to the anatomical findings of de Almeida, who is quoted.

[For surgeons contemplating severance of the common or internal carotid artery, prior studies after the author's fashion could give advance information relative to possible intracranial sequelae—J.P.T.]

Fifteen roentgenograms.

JOSEPH P. TOMSULA, M.D.
Baton Rouge, La.

A Scintillation Counter for the Diagnosis and Localization of Intracranial Neoplasms. Michel Ter-Pogossian, William B. Ittner, III, William B. Seaman, and Henry G. Schwartz. Am. J. Roentgenol. **67:** 351–357, March 1952.

Because of the low efficiency of the Geiger-Müller counter in localizing intracranial neoplasms following

the injection of I^{131}-tagged fluorescein, the authors have devised a scintillation counter. This instrument they have found to be about two hundred times as efficient for the detection of gamma rays from I^{131} as the conventional thin-window Geiger-Müller counter and about forty times as efficient as a Geiger counter with a bismuth-coated cathode. With such increased efficiency, smaller amounts of radioactive material are required (approximately 0.25 mc. of diiodofluorescein) and the time for tumor localization is reduced from two or three hours to thirty minutes or less.

There has been a great deal of discussion about the stability of scintillation counters and the most satisfactory type of scintillating crystal. The authors, having made detailed investigations, favor sodium iodide crystals (with added thallium impurity). The electronic equipment requires that the high voltage be well regulated to avoid appreciable change in the counting rate. The stability of the instrument was subjected to test and found satisfactory.

Two photographs.

J. DURLACHER, M.D.
Indiana University

Pterional Meningiomas "En Plaque." Francesco Castellano, Beniamino Guidetti, and Herbert Olivecrona. J. Neurosurg. **9**: 188–196, March 1952.

This communication deals with 15 surgically verified and 10 clinical cases of sphenoidal meningioma "en plaque." Nineteen of the tumors occurred in women and 6 in men. The average duration of symptoms was four years.

Unilateral exophthalmos was the most frequent initial complaint. In 11 cases it was recorded as the first symptom, and in the remaining 14 it developed during the course of the disease. In 4 cases temporal swelling was the first symptom, and in 10 cases it occurred subsequently. Headache was the initial symptom in 5 cases and subjective dimness of vision in 4 other cases. Convulsions occurred in 4 cases.

In 24 of the 25 cases the diagnosis of sphenoidal meningioma "en plaque" was verified roentgenographically. The roentgenograms showed a sclerosis of the ala parva. The orbital roof, floor of the middle fossa, and the greater wing of the outer wall of the orbit were often involved. In 1 case there was absorption of the sphenoidal ridge. The superior orbital fissure was narrowed in 12 cases and the optic foramen in 2. In 6 cases the foramen spinosum was distinctly wider on the side of the tumor. In 2 cases there were signs of increased intracranial pressure.

In the cases of meningioma not operated upon, the encephalograms showed little or no ventricular displacement. In the verified cases, the alterations were a displacement of the anterior part of the ventricular system toward the normal side, varying from 1 to 10 mm., and a displacement of the tip of the temporal horn backward, upward, and medially. The extent of bone involvement provides better information with regard to the state of the tumor than does pneumography.

The results of this investigation indicate that the hyperostosing meningiomas of the greater and lesser wings of the sphenoidal bone that cause only slight subjective complaints, with no marked displacement of the ventricular system, should as a rule be treated conservatively, with surgical measures only as a last resort.

Four roentgenograms; 1 table.

HOWARD L. STEINBACH, M.D.
University of California

Tuberculomas of the Brain. Jacob Chandy and Ponnu Isaiah. J. Indian M. A. **21**: 239–242, March 1952.

In India, where tuberculosis is so prevalent, tuberculoma of the brain is common. The authors present 8 cases seen within a year. In 4 patients the cerebellum was involved, and in 4 the cerebrum. The symptoms in all 8 cases were those of an expanding lesion of the brain. Usually the diagnosis was not definite, but in 4 cases it was suggested preoperatively. X-ray examination of the skull showed evidences of increasing intracranial tension—widening of sutures, increased convolutional markings, and thinning of posterior clinoids. The authors were unable to demonstrate intracranial calcification in any of their cases. The lesion was obvious in all cases in the ventriculogram.

Craniotomy was performed, the tumor was excised, and the cavity packed with Gelfoam and Streptomycin. Streptomycin was administered postoperatively for fifteen to forty days. Four of the patients have done well. Four died, 2 suddenly, 1 of multiple lesions, and 1 of recurrent tuberculous meningitis.

Sections taken from the tuberculoma showed two types of picture. In the patients who did poorly there were large areas of caseation, while in the patients who did well there were many giant cells and chronic inflammatory cells, with little caseation.

One table.

ZAC F. ENDRESS, M.D.
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Carotid-Cavernous Aneurysm. Giovanni Ruggiero and Francesco Castellano. Acta radiol. **37**: 121–140, February 1952.

Carotid-cavernous aneurysms are considered from the point of view of etiology, the clinical picture, radiographic findings, and treatment, with an ultimate correlation of all factors. A series of 11 cases was studied.

Etiologically, traumatic and spontaneous varieties are differentiated. Spontaneous cases are of more serious prognosis. They are of acute onset, often with headache and vomiting and a unilateral pulsating exophthalmos accompanied by the subjective symptom of an intracranial thrill and bruit synchronous with the pulse. In traumatic cases the onset is insidious, usually at some indeterminate time after the injury. The patients, as a rule, are younger and the outlook is more favorable.

Carotid-cavernous aneurysms are usually easily diagnosed clinically, but only arteriography can demonstrate the extent of the lesion and its anatomical relationships. For this purpose the authors use a water-soluble medium (Umbradil) and obtain both anteroposterior and axial views. Such studies not only serve to localize the abnormal communication and show its drainage channel development but also warn the surgeon about any developmental abnormality which might otherwise cause tragic consequences should the carotid artery or one of its branches be ligated. This phase of the study is excellently dovetailed into a consideration of surgical attack.

A discussion of various surgical approaches based upon known findings accentuated or clarified by roentgen studies is given. The best results seem to be obtained by primary ligation of the common carotid artery.

Twelve roentgenograms; 11 drawings; 1 table.

JOSEPH P. TOMSULA, M.D.
Baton Rouge, La.

Misleading Results of Pneumoencephalography in an Infant with Severe Hypoglycemic Attacks. Sven Brandt, Erna Christensen, and Jørgen Vesterdal. Acta pædiat. **41**: 167–177, March 1952.

In a five-month-old infant with a severe non-pancreatogenic hypoglycemia of unknown pathogenesis, encephalography through a suboccipital puncture revealed wide areas of air over the left hemisphere. Ventriculography three months later showed a moderate dilatation of the ventricular system as well as large accumulations of air over the right hemisphere. On both occasions the air was localized chiefly in the subarachnoid space. On the basis of these findings, a diagnosis of severe bilateral cortical atrophy was made. The child died at the age of ten months. At necropsy, almost no atrophy of the cortical zone was found, a result quite incompatible with the roentgenographic findings. The authors conclude that subarachnoid accumulations of air, demonstrated by encephalography or ventriculography, are unreliable as a diagnostic guide in infants.

Four roentgenograms; 2 photographs.

Hand-Schüller-Christian Syndrome. Report of Case. Abdel Azim El Gholmy and Bayoumi El Sebai. Arch. Pediat. **69**: 108–115, March 1952.

Hand-Schüller-Christian disease always starts insidiously, as a rule becoming manifest in early childhood; the course is usually progressive. The granulomatous deposits of cholesterol-containing histiocytes show a predilection for the skull, producing geographic defects in the vault. The decalcification and malformation of the sella turcica, which are so important because of the effects on the hypophysis, are usually clearly evident on the roentgenogram. Clinically there are polyuria and polydipsia. Exophthalmos, often one-sided at first, results from invasion of the retro-orbital space by xanthomatous tissue. Spontaneous remissions occur, and the masses regress with x-ray therapy, but new lesions continually appear.

The authors present the first case of Hand-Schüller-Christian disease recorded in Egypt. This case showed the classical x-ray findings in the skull, as well as exophthalmos and diabetes insipidus (controlled by pitressin). There was radiological evidence of fibrosis in both lung bases.

One roentgenogram; 1 photomicrograph.

ZAC F. ENDRESS, M.D.
Pontiac, Mich.

Hemangiomas of the Frontal Bone. Report of Three Cases. Edgar Miller Holmes, William Herbert Sweet, and George Kelemen. Ann. Otol., Rhin. & Laryng. **61**: 45–61, March 1952.

Three cases of hemangioma of the frontal bone are reported, a condition which, according to a survey of the literature, seems to be extremely rare. Diagnosis was made by x-ray and in 2 cases was fully confirmed by microscopic study following operation. The third case did not appear to require surgical intervention.

The pathogenesis of these tumors is unknown. In none of the 3 cases reported here was there a history of trauma. A division into capillary and cavernous forms is probably unwarranted, since both exist side by side, the large cavernous lakes being the result of confluence of capillary conglomerates. On the basis of the histologic picture, a vascular origin is assumed. The extraordinary increase in activity in all the vessels as against the normal or less than normal osteoblastic or osteoclastic activity leaves the authors in no doubt on this point.

In the pre-roentgen era, there was no way to diagnose the tumor before removal. X-ray examination, however, reveals a honeycomb structure in the anteroposterior view and a sun-ray disposition of the spicules in the profile view, appearances so characteristic that practically the only other possibility remaining is an osteosarcoma. The slow development leaves enough time to exclude specific inflammations, osteitis fibrosa, etc.

Operative results are definitive if no parts of the tumor are left behind. If removal is incomplete, a recurrence is probable, with a comparatively rapid growth.

Seven roentgenograms; 8 photomicrographs.

STEPHEN N. TAGER, M.D.
Evansville, Ind.

Bilateral Congenital Choanal Atresia in Newborn. Harry J. Cohen and Ira S. Witchell. Am. J. Dis. Child. **83**: 328–332, March 1952.

Congenital choanal atresia may be unilateral or bilateral, complete or incomplete. A bilateral case in a newborn infant is presented here, with autopsy findings.

The primary symptom of congenital choanal occlusion is inability to breathe through the affected nostril. When respiratory difficulty, cyanosis, and dyspnea are present in the newborn infant, an immediate investigation of the patency of the posterior choanae should be undertaken. Passage of a rubber nasal catheter through the nose into the nasopharynx is the simplest method. This should be done on both sides. If the catheter does not pass, mild silver protein, or other colored fluid, can be instilled into the nares. If the fluid appears in the pharynx in a case in which the catheter cannot pass, a partial obstruction (incomplete) can be assumed. If the fluid does not pass, the diagnosis of complete obstruction may be confirmed by roentgenography after instillation of opaque oil. A probe may be useful in determining the character of the obstructing structure.

Many forms of treatment have been advocated. These range from simply breaking through the obstruction, followed by removal of the remaining wall and posterior border of the vomer by biting forceps, to a transpalatal approach.

Routine examination to determine patency of the choanae should be performed in all cases of tonsillectomy and adenoidectomy.

[For a paper dealing particularly with the roentgen features of choanal atresia, see Whitehouse and Holt: Radiology **59**: 216, 1952.]

One roentgenogram; 1 photograph.

BERT H. MALONE, M.D.
Brunswick, Ga.

Does the Utricular Otolithic Membrane Move on Postural Changes of the Head? Grethe Vilstrup and Thure Vilstrup. Ann. Otol., Rhin. & Laryng. **61**: 189–197, March 1952.

In order to ascertain whether postural changes of the head result in changes in the position of the otoliths in the labyrinth, the authors made roentgenographic

studies of sharks. The problem is of decisive importance to a conception of the mechanism of the labyrinthine function.

Satisfactory roentgenograms were obtained of 8 half-skulls in different positions immediately after decapitation of the sharks. Measurements were then obtained of the angle between a line through the upper margin of the otolith membrane and a metal wire which had previously been inserted along the medial wall of the cranium a little dorsally to the level of the recessus utriculi. In all the specimens the first line, designated as the "otolith-line," ran rostro-dorsally; the second line, the "wire line," was almost horizontal. An angular difference between these lines in the "chin-up" view and the "chin-down" view would mean that the otolith membrane was rotated in relation to the cranium and, therefore, in relation to the macula, which has to follow the movements of the cranium. The measuring itself was carried out by means of a microscope with a metal centering circular stage graduated along the margin to 360° and equipped to allow readings with an accuracy of 0.1°.

All the specimens showed a difference in the measurement with change in position, with a wider angle in the chin-down view, the difference averaging 2.0° ± 0.08°. This, the authors state, means that the otolith membrane does not quite follow the rotation of the cranium but is lagging, *i.e.*, trying to remain in the same place when the cranium rotates.

To supplement the above studies, for which a lateral exposure was used, an attempt was made to demonstrate similar movements in the frontal plane, but with slight success.

The authors believe that their studies support the idea that a shift in the effect of gravitation upon the otolithic membrane brings about a deflection of the projecting parts of the sensory cells (the "threads" or "cilia"), which may reasonably be assumed to constitute the immediate cause of the changes in the sensory epithelium decisive of transmission of nervous impulses.

Two roentgenograms; 2 drawings.

STEPHEN N. TAGER, M.D.
Evansville, Ind.

THE CHEST

Evaluation of Ioduron B in Bronchography. I. A Preliminary Study on Animal Tissues. Wm. Hentel, M. B. Cohen, and L. C. Brandenstein. Dis. of Chest **21**: 280–285, March 1952.

Evaluation of Ioduron B in Bronchography. II. A Preliminary Study in Man. M. B. Cohen, Wm. Hentel, and L. C. Brandenstein. Dis. of Chest **21**: 286–295, March 1952.

The authors studied the effect of Ioduron B, a water-soluble contrast medium used for bronchography, on 20 guinea-pigs, injecting 0.3 c.c. directly into the trachea and bronchial tree. In a 450-gm. guinea-pig this was considered the equivalent of 40 c.c. in a 78-kg. man. The animals were divided into 5 groups, which were sacrificed after various intervals, along with 2 controls for each group. The trachea, lungs, heart, liver, kidneys, and bladder were studied.

In Group 1, sacrificed at the end of forty-eight hours, microscopic examination of the lungs demonstrated a perivascular and peribronchial infiltrate, with slight hyperplasia of the peritracheal lymph nodes. No other abnormalities were noted. Group 2, sacrificed at the end of two weeks, showed no abnormal pulmonary findings, but the kidneys presented small scattered foci of lymphocytes in the cortical zone. In Groups 3, 4, and 5, sacrificed after three, six, and twelve weeks, respectively, there were no abnormal findings.

The authors conclude that Ioduron B produces transitory changes in the lungs and kidneys, with no permanent damage to tissues of test animals up to twelve weeks after intratracheal instillation. A series of 5 test animals permitted to live one year showed no abnormal features clinically or pathologically.

Two roentgenograms; 3 photomicrographs.

The authors made a further investigation of the effects of Ioduron bronchography in man, performing the following studies: blood counts, urinalysis, phenolsulphalein excretion tests, determinations of blood urea nitrogen, blood cholesterol and esters, bromsulphalein, cephalin flocculation, and thymol turbidity tests. Ten patients were examined twenty-four to forty-eight hours prior to bronchography, twenty-four to forty-eight hours after bronchography, and at two-week intervals for as long as five months in some instances.

Mild and transient hepatic functional changes were found in 60 per cent of the patients, occurring within a few hours to as long as six weeks after bronchography. Renal functional changes, also mild and transient, occurred in 30 per cent. These changes were observed within a few hours or a few days after bronchography. Hepatic and renal changes were associated in 20 per cent of the series, and either hepatic or renal changes, or both, were demonstrated in 70 per cent.

The hepatic changes were manifested as a rise in cholesterol esters in 4 instances and a depression in 1; an abnormal elevation of thymol turbidity in 1; an abnormal elevation of bromsulphalein in 1, and a 3-plus cephalin flocculation in 1. The renal changes were manifested as a reduction in phenolsulphalein excretion in 2, with a corresponding rise in blood urea nitrogen; in a third there was reduced phenolsulphalein excretion without a rise in urea nitrogen.

One photograph; 12 tables.

HENRY K. TAYLOR, M.D.
New York, N. Y.

Elimination of the Water-Soluble Contrast Medium in Bronchography. "Functional Bronchography." Mario Lenzi. Acta radiol. **37**: 103–110, February 1952.

The non-absorbability of iodized oil limits its use in bronchography to reproduction of the morphologic appearance of the tracheobronchial tree. The use of a water-soluble medium and observation of the absorption time permit also a study of bronchial function. In addition to showing the stages of bronchial filling and alveolar filling, such a medium demonstrates the lymphovenous stage of absorption, "which may be said to represent lymphovenography."

Normally complete absorption of the medium occurs in thirty to forty-five minutes. More rapid absorption is rare but may occur with hyperthyroidism, tachycardia, or fever. Absorption is long delayed in bronchiectasis, requiring seven, ten, or even twelve hours. The walls of neoplastic cavities show delayed absorption while the walls of acute abscesses absorb the medium relatively rapidly. Uninfected cavities of the cystic lung empty, on the average, in an hour and a half to two hours.

Instances have been observed where bronchioles are normal but distal arborizing segments are not visualized, notably in asthma or chronic bronchitis (spasm). In some of these the use of adrenalin-like substances restores normal function.

Thirteen roentgenograms.

JOSEPH P. TOMSULA, M.D.
Baton Rouge, La.

Angiopneumography in Differential Diagnosis. C. Scarinci. Radiol. med. (Milan) **38**: 97–105, February 1952. (In Italian)

According to Scarinci, the radiological diagnosis of chronic pulmonary shadows is facilitated by the visualization of the pulmonary vessels. This requires no special apparatus. A single film taken three seconds after the intravenous injection of an opaque medium will give a good representation of the arterial system of the lungs. Three cases are discussed in which the plain film of the chest showed similar pulmonary shadows. In 2 of these, pneumoangiograms demonstrated normal lung arteries, and in each instance the patient was found to have a simple lung abscess. In the third case a pneumoangiogram showed amputation of several branches of the left pulmonary artery. This patient was found to have carcinoma.

The author's experience suggests that whenever bronchoscopy, bronchography, and laboratory and cytological studies are inconclusive, the appearance of the pulmonary arteries may give a positive diagnostic clue.

Thirteen roentgenograms.

CESARE GIANTURCO, M.D.
Urbana, Ill.

Angiographic Studies After Pulmonary Resection. Carlos R. Pacheco and Hermilo del Castillo. J. Thoracic Surg. **23**: 262–271, March 1952.

After a short résumé of the history of pulmonary angiography and a brief description of the normal pulmonary angiogram, the authors describe the findings in 13 cases in which angiographic studies were made following pulmonary resection. Three patients had undergone pneumonectomy and in the other 10 lobectomy was performed. According to the authors, the angiographic examination gives valuable information as to the functional state of the pulmonary vessels and mediastinum.

In the cases studied, no method was used to fill the cavity remaining after pneumonectomy or lobectomy; instead the rest of the pulmonary tissue was left to re-expand and fill the space left after the operation. In all cases the lung tended to expand, thus representing more tissue surface to be supplied, as demonstrated by angiography, with the same number of blood vessels, since these are unable to multiply themselves, giving rise to a respiratory insufficiency in the affected lung.

It was observed, also, that both the pulmonary artery and mediastinum tend to be displaced toward the pneumonectomized side, and that such a displacement, also found in cases of postoperative complications, is more marked as time passes. In cases with pneumothorax there is no alteration of the pulmonary vessels, since the presence of the pneumothorax acts to prevent the overexpansion of the remaining pulmonary tissue.

No investigation of the oxygen saturation of the blood or of respiratory air volumes for the 13 patients is mentioned.

Ten roentgenograms; 1 table.

C. J. CORRIGAN, M.D.
St. Paul, Minn.

Agenesis of the Right Lung. Report of Three Cases. Louis B. Thomas and Edward A. Boyden. Surgery **31**: 429–435, March 1952.

Three patients admitted to the University Hospitals, Minneapolis, within a period of a few months were found to have agenesis of the right lung. The first, a 2-year-old boy, died during the removal of a foreign body from a bronchus. At autopsy, the somewhat flattened lung bore little superficial resemblance to a left lung, but upon dissection was found to have three lobes and could be classified as belonging to Type II of lungs having a cleft upper lobe. In the second patient, one of a pair of 16-day-old twins, the diagnosis of absence of the right lung was made roentgenologically, but the infant died following operation for tracheoesophageal fistula. The left lung was again three-lobed, but belonged to Type IV, having a cleft left upper lobe associated with an ectopic left pulmonary artery. The third patient, a full-term male infant, never breathed beyond a few spasmodic gasps. Autopsy and dissection revaled an incompletely divided left lung, with atypical branching of the bronchial tree, a nubbin at the site of bifurcation of the trachea (which may represent a right bronchial bud), a retrobronchial left pulmonary artery, coarctation of the aorta, a supernumerary digit, and hydronephrosis due to a stricture of the ureter just below the ureteropelvic junction.

These 3 cases are apparently the first in which the segmental anatomy of the single remaining lung has been worked out. In each case there were striking deviations in the bronchovascular pattern of the lung. These, together with associated congenital anomalies, suggest an interference with normal developmental processes beginning at the end of the first lunar month.

One roentgenogram; 3 color plates.

Explosive Outbreak of an Atypical Pneumonia ("K-8 Fever"). Philip Troen. Arch. Int. Med. **89**: 258–269, February 1952.

Recently, at an Army hospital in Kobe, Japan, an explosive outbreak occurred of a disease with an incubation period of perhaps one to two weeks. In view of the still unknown nature of the disease, it is referred to for convenience as K-8 fever, after the Kobe Eighth Station Hospital. Characteristic features were hazy pneumonic patches, frequently slow to resolve, and severe constitutional symptoms in addition to chest pain and non-productive cough. Stiffness of the neck was frequent, and a localized cutaneous eruption was noticed in several patients. Positive physical findings were otherwise few on admission.

This study is based on 45 patients whose conditions were related clinically, roentgenographically, epidemiologically, and by laboratory findings.

The pulmonary involvement was a striking aspect of the disease. Roentgenologically this ranged from faint, small (1 cm.) patches to extensive hazy densities. The involvement was bilateral in 34 patients and unilateral in 10. One-third of the patients showed clearing of the chest roentgenogram within ten days. In one-fourth clearing was still incomplete three to

four weeks later. In 1 case no positive chest roentgenogram was obtained. Although many of the patients with temperatures over 103° F. had the most marked pulmonary involvement, there was no overall positive correlation between the extent of changes on the chest roentgenogram and the height of the febrile reaction, nor was there any correlation between the extent of pulmonary involvement and the time required for clearing.

Normal white blood cell counts were the rule, with a later tendency to lymphocytosis and eosinophilia. The erythrocyte sedimentation rate was initially elevated, tending to remain so while pulmonary involvement persisted. A large percentage of abnormal cephalin-cholesterol flocculation was noted, with little other evidence of hepatic damage or protein abnormality. Attempts to establish a diagnosis have thus far been unsuccessful. Bacteriologic studies revealed no pathogen. Attempts to isolate a viral or rickettsial agent from blood clots and throat washings failed. Results of serologic studies, including cold agglutination, Q fever and psittacosis complement fixation, and influenza hemagglutination inhibition were negative.

Fifteen patients were treated with Aureomycin, 7 with penicillin parenterally in large doses, and 8 with both Aureomycin and penicillin. Twelve patients received no antibiotics. When the average duration of fever in each of the treated and the untreated groups was calculated, it was found that there was no appreciable difference. In 2 patients the illness developed toward the close of a ten-day course of administration of 600,000 units of penicillin procaine daily for the treatment of syphilis. Another patient was receiving Aureomycin for tonsillitis throughout what must have been the exposure and early incubation period of the illness. Thus, penicillin and Aureomycin were useless in preventing the disease, and there is no evidence that the antibiotics were of benefit therapeutically.

Seven roentgenograms; 1 drawing; 7 tables.

Diffuse Interstitial Fibrosis of the Lungs. Eli H. Rubin, Bernard S. Kahn, and David Pecker. Ann. Int. Med. **36**: 827–844, March 1952.

The authors report at great length a case of diffuse interstitial pulmonary fibrosis with necropsy findings in a woman of forty-five. They present also summaries of 13 proved cases which they found in a review of the literature. Of the 14 patients, 6 were men and 8 women, and the age range was from twenty-one to sixty-eight years.

The outstanding symptoms were cough, variable degrees of expectoration, occasional hemoptysis, chest pain, fever, increasing dyspnea and cyanosis. In a few instances the onset was insidious; in most it was acute, even explosive. The shortest duration of life from the onset of the final illness was thirty-one days; the longest, three and a half years. The physical signs relating to the pulmonary disease, as well as the laboratory findings, were in the main non-informative. The roentgen findings were not distinctive. A frequent observation was the presence of miliary, nodular, or mottled infiltrations, involving both lungs diffusely and often associated with conglomerate areas of consolidation and occasionally pleural effusion, especially toward the end of life. In addition, cardiac enlargement was usually present.

The differential diagnoses entering into consideration were tuberculosis, atypical pneumonia, chronic pulmonary infection, pulmonary edema associated with organizing pneumonia or cardiac disease, inhalational diseases, and pulmonary manifestations of systemic diseases, such as blood dyscrasias, amyloidosis, and allergic conditions, as well as metastatic neoplasm. In the case studied by the writers, the roentgenographic appearances suggested sarcoidosis.

In all instances, the postmortem findings were of a fairly uniform pattern. A diffuse interstitial fibrosis of both lungs was noted, with thickening of the alveolar septa, the latter being replaced by varying degrees of hyalinized connective tissue. The progressive nature of the disease was supported by the presence of different stages of development of the fibrotic reaction in various parts of the lungs.

It is postulated that this condition is caused by a virus and that the particular pathologic features represent one form of tissue response to a disease which may be associated with more widespread involvement. It is suspected that recovery may take place, but this cannot be proved, since the diagnosis depends on a complete autopsy.

Two roentgenograms; 3 photomicrographs; 2 photographs.

STEPHEN N. TAGER, M.D.
Evansville, Ind.

Disseminated Nodular Pulmonary Infiltrations of an Indeterminate Nature in Apparently Healthy Persons. Aaron D. Chaves and Hans Abeles. Am. Rev. Tuberc. **65**: 128–141, February 1952.

Seventy-five cases of disseminated pulmonary infiltrations were selected for study out of a large volume of material available to the authors. These patients had no obvious intrathoracic or peripheral lymphadenopathy and no history of such involvement or of known lesions in other organs. All were followed, for at least one year in cases with spontaneous clearing and at least two years for the others. Despite extensive study, a definite diagnosis accounting for the chest findings could not be made in any of the cases.

Roentgenographic findings were variable but were classified according to the predominant characteristics of the lesions into fine (very small), medium (to 3 mm.), and large (3 to 5 mm.) nodular infiltrations, and mixed lesions, consisting of nodular infiltrations of any size in association with linear density, either reticular or peribronchial in type. Involvement was symmetrical in 72 cases, with uniform distribution from apex to base in 36. In 56 patients there was spontaneous clearing and in 13 no change was demonstrable. Progression was noted in the remaining 6, with the development of varying degrees of pulmonary insufficiency. One patient died of right heart failure and in 3 extensive pulmonary fibrosis developed with multiple bullae. In none of the patients did disseminated pulmonary calcification ensue.

Since the cause of the lesions cannot be determined and the course is benign in most of them, the authors feel that they should be kept under observation and not be treated empirically with the various drugs now available. Specific infectious agents should be excluded as a cause, however, by all possible means. It is felt that the group under study probably represented a heterogeneous group of granulomatous lesions caused by a variety of agents not readily identifiable.

Fifteen roentgenograms.

JOHN H. JUHL, M.D.
Minneapolis, Minn.

Developmental Origin of Cystic, Bronchiectatic and Emphysematous Changes in the Lungs. A New Concept. Edgar Mayer and Israel Rappaport. Dis. of Chest **21**: 146–160, February 1952.

The authors believe that disturbances in the postnatal development of the lungs play the most important role in the production of cystic, bronchiectatic and emphysematous changes. Their reasons are as follows:

1. The old view that the lung is fully developed at birth and only enlarges with growth no longer holds. The lungs of the adolescent represent the result of continued postnatal development, which includes growth of new structures as well as increase in size. Willson (Am. J. Anat. **41**: 97, 1928) demonstrated growth of new lung units in growing children and concluded that postnatal lung development continues at least until the age of seven and in some instances to the age of fourteen. Bremer (Publ. No. 459, Carnegie Inst. of Washington, July 1935) established the fact that the lung grows not by increase in size of the lobules but by increase in their number.

2. There is an increasing number of reports of cystic and bronchiectatic changes associated with certain diseases either characteristic of childhood or beginning in childhood and continuing into adult life. These diseases may be divided into two groups: (*a*) disturbances in glandular function, fibrocystic-pancreatic disease, biliary and pituitary insufficiency, etc.; (*b*) affections of the reticulo-endothelial and connective-tissue systems, as xanthomatosis, lipoid granulomatosis, reticuloendotheliosis, tuberous sclerosis, scleroderma, etc.

3. Cysts, bronchiectasis, and emphysema, are found by clinical experience to be an inseparable triad.

4. An extensive literature covering the past twenty-five years shows (*a*) that cystic changes in the lungs occur far more frequently than can be accounted for by congenital anomalies; (*b*) that cystic changes have been observed in previously normal lungs in an increasing number of cases when long range observation with the aid of x-rays could be made; (*c*) that cystic lung changes are often combined with bronchiectatic and emphysematous changes which are obviously acquired.

The authors' concept is that "the lung at birth consists largely of the central bronchial branches and their supporting interstitial framework carrying the rich blood and lymph vessels. These bronchi terminate in the lung buds from which the first alveoli are formed by distention, as the infant begins to breathe. Postnatal development consists of continued branching of the peripheral ends of the infantile bronchial tree. Peripheral bronchioles pass inward to become major bronchi and original alveoli become bronchiolar branches, *i.e.*, the postnatal development of the lungs during childhood years."

Defective postnatal development is regularly observed in children suffering from conditions affecting their metabolism during early life. The type of lesion produced depends on the nature and severity of the affection as well as the period of lung development at which it occurs.

The authors' scheme of evolution indicates that the sequelae of developmental defects are determined by mechanical obstructions in the bronchi produced either by infections or allergies, or their combinations. Cystic or bronchiectatic lesions predispose their bearers to infections, which in turn bring about active bronchiectatic and cystic disease. Bronchiolar defects predispose allergic bearers to respiratory tract allergies. The fixation of allergic reactions to the respiratory tract is presumably favored by disturbed vagosympathetic nervous function in such developmental defects.

Eight roentgenograms; 3 photographs.

HENRY K. TAYLOR, M.D.
New York, N. Y.

Localized Hypertrophic Emphysema. Robert R. Shaw. Pediatrics **9**: 220–227, February 1952.

Localized emphysema involving a segment of a lobe or a whole lobe which is not associated with an aspirated foreign body or tenacious mucus of an upper respiratory infection is rare and has received little attention in the literature. The author considers it a distinct clinical entity occurring in infants, and of congenital origin.

Diagnosis of localized hypertrophic emphysema in infants depends upon (1) history, (2) physical examination, (3) correct interpretation of roentgenograms of the chest, (4) bronchoscopic examination, and (5) an awareness that there is such a clinical entity. The most important point in the history is the development of a wheeze in the absence of evidence of a respiratory infection. On physical examination there will be noticed in-pulling of the chondral arch and lower sternum on inspiration. This is due to obstruction of the air passage as a result of compression and distortion of the bronchi to the normal segments by the emphysematous segment. Findings on auscultation will seem to be at variance with the x-ray findings because breath sounds are absent over the pulmonary segments that are most air-containing and accentuated over the apparently atelectatic segments. This seeming paradox is the clue to the diagnosis. Pneumothorax may be suspected upon first glance at the chest film, but the presence of fine linear shadows through the translucent area, indicating trabeculae, will usually make distinction possible. Bronchoscopy will rule out obstruction of the major bronchi and will reveal only distortion of the lower trachea and major bronchi.

Surgical resection of the emphysematous segments or lobe is definitely indicated in this condition.

Two cases of localized hypertrophic emphysema, in a 4-year-old boy and a 7-week-old girl, are reported to illustrate the diagnostic and therapeutic problems presented.

Seven roentgenograms; 1 photograph.

Bronchial Obstruction with Chronic Atelectasis and Pneumonitis Due to Hilar Lymphadenitis After Lobectomy and Lingulectomy. A Case Report. John Y. Templeton, III. J. Thoracic Surg. **23**: 169–173, February 1952.

The syndrome of chronic atelectasis and pneumonitis, most often involving the middle lobe and known as the middle lobe syndrome, has been frequently described. It is usually the result of narrowing of the bronchus, which may be due to various causes, as enlarged lymph nodes or bronchial adenomas. Not infrequently other lobes beside the right middle lobe are affected. The author describes a case in which atelectasis and chronic pneumonia developed in the remaining part of a left upper lobe a few weeks after lower lobectomy and lingulectomy.

The patient had a long standing history of chronic cough and suppurative pulmonary disease. Bronchography showed saccular bronchiectasis involving all

of the lower lobe and the lingula of the left upper lobe. Otherwise the bronchogram on each side was normal. A left lower lobectomy and lingulectomy was performed without incident. The remainder of the left upper lobe appeared normal at surgery, and no unusual enlargement of the hilar lymph nodes was noted. The bronchial stumps were reinforced by suturing over them mediastinal tissue and lymph nodes.

The postoperative course was satisfactory for about three weeks. At the end of that time a septic type of fever developed and the patient began to have troublesome and productive cough. Roentgenograms showed the left hemithorax to be obscured and the left upper lobe to be only partially aerated. A bronchogram showed puddling of Lipiodol in the left upper lobe with narrowing of the main left upper lobe bronchus. A second thoracotomy done about nine weeks after the original operation revealed an infected and almost completely atelectatic left upper lobe. There was a ring of enlarged lymph nodes adherent to one another and forming an almost complete encirclement of the left upper lobe main bronchus, markedly compressing it. A lobectomy was done, and the patient was in good health eight weeks after the operation.

Dissection of the specimen showed that the bronchial obstruction was due entirely to compression by the encircling lymph nodes. The two bronchial stumps from the original lobectomy were well healed and in no way encroached upon the lumen of the bronchus.

This case report illustrates strikingly the fact that enlargement of adjacent lymph nodes may well cause compression of a bronchus and subsequent disease in the lung peripheral to the compression.

Three roentgenograms; 1 photograph.

C. J. CORRIGAN, M.D.
St. Paul, Minn.

Terminal Bronchiolar or "Alveolar Cell" Carcinoma of Lung: A Case Report. H. H. Dunham and V. G. Smith. J. Kansas M. Soc. **53**: 117–121, March 1952.

A case of alveolar-cell carcinoma of the lung in a 64-year-old man is presented. The case is similar to previously reported cases in all respects.

Cough and dyspnea are the most prominent clinical features of this condition. The cough may be dry at first, but later becomes productive of profuse watery or frothy sputum which may or may not be streaked with blood. Frank hemoptysis is almost never associated with this disease [since the lesions lie beyond the bronchi and rarely ulcerate]. Loss of weight is common and weakness may be conspicuous. A few isolated cases seem to have been cured by surgical resection, but in the majority of patients surgery is out of the question when the diagnosis is made. This was true in the authors' case.

Two types of roentgenologic pattern are found. In one type a single segment or lobe is homogeneously involved, while in the second many nodules of various sizes are found in both lungs. Atelectasis, hilar node enlargement, and cavitation are not usually seen.

Photomicrographs from the case reported show the typical adenomatous pattern with papillary formation and alveoli lined by tall columnar cells, as well as massive lymphatic invasion. No intrinsic involvement of the bronchi was found on dissection.

One roentgenogram; 1 photograph; 3 photomicrographs.

ZAC F. ENDRESS, M.D.
Pontiac, Mich.

Coexistent Bronchogenic Carcinoma and Active Pulmonary Tuberculosis. A Report of Five Cases with Autopsy Findings. Jacob Goldberg, Edmundo R. Figueras, and Bernard Barshay. Dis. of Chest **21**: 184–193, February 1952.

The authors report 5 cases of bronchogenic carcinoma found in association with active pulmonary tuberculosis, with pertinent autopsy observations. These 5 cases were encountered in a series of 203 postmortem examinations done in a Veterans Administration tuberculosis hospital during a four-year period.

There are many difficulties associated with the diagnosis of pulmonary carcinoma in patients with pulmonary tuberculosis. The tuberculous process usually dominates the clinical picture; the two disease processes may resemble each other; a unilateral wheeze may be attributed to a tuberculous bronchial obstruction; upper lobe cavities with enlarged hilar nodes frequently mask hilar and parenchymal shadows; lower lobe infiltrates may be mistaken for bronchogenic spreads; a carcinomatous abscess may be mistaken for a tuberculous cavity.

Certain clinical features should arouse suspicion of a neoplasm: (1) persistent dull pain in the chest in the absence of pleural complications or other obvious cause; (2) a profuse sudden hemoptysis in an individual with limited pulmonary tuberculosis; (3) atypical changes appearing in serial films not in keeping with progressive tuberculosis.

The coexistence of pulmonary tuberculosis and carcinoma of the lung may be expected to occur more frequently, because of the increased frequency of tuberculosis in older people and the increased incidence of pulmonary carcinoma.

Nine roentgenograms; 5 drawings; 1 table.

HENRY K. TAYLOR, M.D.
New York, N. Y.

Pulmonary Adenomatosis. John M. Dennis, William T. Raby, and Emil J. C. Hildenbrand. Ann. Int. Med. **36**: 667–678, February 1952.

The authors review at length the literature on pulmonary adenomatosis and report a case of their own in which, in general, the clinical, pathologic, and roentgen findings were those described in other recorded examples of the disease. Their patient, however, showed three unusual findings: (1) unexplained roentgen changes in the lungs two years prior to death; (2) the presence of large, faintly stained homogeneous bodies in the cytoplasm of many of the alveolar lining cells; (3) hypertrophy of the islet cells of the pancreas, with a tendency toward acinar formation.

Roentgen changes in pulmonary adenomatosis are not characteristic. The pulmonary lesions fall roughly into two groups or, more commonly, a combination of the two. (1) In the first there is a large area, or areas, of soft, rather homogeneous infiltration, resembling an inflammatory consolidation. The area or areas are not usually lobar in distribution but are often extensive and bilateral, and involve most of the lung fields. Atelectasis is not a prominent feature and is important in ruling out bronchogenic carcinoma. Terminally, clinical signs of infection are encountered and the diagnosis of pneumonia is most often made. (2) The second picture is one of small, soft, patchy, nodular, widely disseminated areas of infiltration, which are usually ill-defined and often confluent. This type of

lesion may simulate metastatic carcinoma, tuberculosis, bronchopneumonia, sarcoidosis, silicosis, coccidioidomycosis and Hodgkin's disease. In none of the cases reported previously have roentgen changes been demonstrated in the lungs two years prior to death.

A clinical diagnosis of pulmonary adenomatosis should be suspected in the presence of (1) a chronic pulmonary disease in which repeated attacks of acute pneumonia occur, (2) a non-specific patchy or homogeneous infiltration on the roentgenogram, and (3) the production of a large amount of thin, watery, mucoid, "soapsuds-like" sputum.

Three roentgenograms; 3 photomicrographs; 1 photograph.

STEPHEN N. TAGER, M.D.
Evansville, Ind.

Bronchiectatic Aspergillosis. Olivier Monod, G. D. Pesle, and M. Labeguerie. J. franç. de méd. et chir. thorac. **6**: 229–244, 1952. (In French)

The term *bronchiectatic aspergilloma* is proposed for a particular form of pulmonary aspergillosis in which a myceline tumor is found in a dilated bronchial cavity. It is manifested clinically by repeated hemoptysis, absence of tubercle bacilli in the sputum, and sometimes by the presence of mycelia in the sputum. The radiologic image consists of a rounded homogeneous opacity partially surrounded by air in a cavity. Three cases have been treated by segmental excision.

Eight roentgenograms; 3 photomicrographs.

CHARLES M. NICE, M.D.
University of Minnesota

Bronchial Onset of Reinfection Tuberculosis in the Adult. Juan J. Castillo. Dis. of Chest **21**: 320–326, March 1952.

The author reports the results of mass examination of 500 persons apparently well but living in intimate contact with patients known to carry tubercle bacilli. Positive x-ray findings were found in 20 per cent, while tubercle bacilli were recovered by bronchial lavage in 36 per cent. Because of the higher incidence of positive findings with the latter procedure, bronchoscopy was instituted in 95 of the positive lavage cases, revealing tracheobronchial lesions in 40 per cent (24 per cent with positive x-ray findings and 16 per cent with negative films).

A careful examination of the 14 patients with tracheobronchial lesions as proved by bronchial lavage, but without x-ray evidence of chest involvement, leads the author to believe that he is dealing with a new syndrome occurring before lung invasion, as the first stage of reinfection tuberculosis in the adult. Because of that conclusion, it is apparent that, in spite of a negative roentgenogram, no contact should be considered free of disease unless it is proved by bronchoscopy and lavage that no tracheobronchial tuberculosis exists.

Seven roentgenograms.

HENRY K. TAYLOR, M.D.
New York, N.Y.

Has Tuberculous Lymph Node Perforation in Adults Practical Significance? F. Suter and H. Iselin. Schweiz. med. Wchnschr. **82**: 273–282, March 15, 1952. (In German)

This article is of interest mainly to clinicians engaged in the long-term treatment of pulmonary tuberculosis and to investigators concerned with the natural history of that disease. Endoscopists and chest surgeons might also benefit by the observations of the authors. They conclude that perforation of hilar lymph nodes into the bronchial tree is not limited to children but occurs also in adults with the reinfection type of pulmonary tuberculosis. This condition was encountered in 21 instances among 537 adult tuberculous patients in whom bronchoscopy was performed, suggesting that perforation into the bronchus is at least one of the mechanisms producing tertiary pulmonary tuberculosis.

Twenty roentgenograms.

GERHART S. SCHWARZ, M.D.
New York, N. Y.

Primary Pulmonary Tuberculosis as a Cause of Bronchiectasis in Children. Lloyd B. Dickey. Dis. of Chest **21**: 260–267, March 1952.

The author believes, with others, that primary pulmonary tuberculosis is frequently a cause for bronchiectasis, especially when the primary infection is evident as a massive shadow on the x-ray film. The bronchiectatic changes are believed to be due to atelectasis.

Five case histories are included, illustrative of the various sites at which atelectasis can contribute to the production of bronchiectasis in children during or after primary infection. In 2 cases an associated sinusitis cleared after lobectomy, suggesting that it must have been secondary to the bronchiectasis.

The serious character of bronchiectasis as a complication of the primary infection gives added weight to the importance of prophylaxis against tuberculosis, especially in children.

[A report by Mayer and Rappaport on the developmental origin of bronchiectatic and other changes in the lungs (abstracted above, p. 113) is of interest in this connection.]

Eight roentgenograms.

HENRY K. TAYLOR, M.D.
New York, N.Y.

Cause and Sequelae of Intrapulmonary Shadows in Primary Tuberculosis. G. M. H. Veeneklaas. Am. J. Dis. Child. **83**: 271–281, March 1952.

In 1920 Eliasberg and Neuland (Jahrb. f. Kinderh. **93**: 88, 1920) described a large shadow observed in the lungs of a few children who were not very ill and had positive tuberculin reactions. It was of an even density, wedge-shaped, with its apex toward the hilus, and covered the area of an entire lobe. Starting from the periphery, the process of clearing required from a few months to more than a year. These shadows were most frequently found in the middle and upper lobes. Later it was discovered that they may cover a pulmonary segment only. Pathological, bronchographic, and bronchoscopic investigations in recent years have revealed the cause to be a bronchial obstruction, either because a tuberculous lymph node involves the bronchial wall in the disease process or because it perforates into the bronchial lumen.

The author found lobar and segmental shadows in 35 of 102 patients with primary type pulmonary tuberculosis who entered the pediatric department of the Utrecht University Hospital (Utrecht, Netherlands). His own observations lead him to believe that perforation of a lymph node into a bronchus is often the underlying lesion in such cases. His hypothesis is that with increasing firmness of the contents of the lymph node

and increasing narrowing of the bronchi, obstruction will occur more and more easily after rupture. However, the contents of the tuberculous nodes are often liquid, and the bronchi widen with advancing age. The frequency of primary tuberculosis also increases with age; therefore, it may evidently be assumed that many of these perforations occur unnoticed and that only a minority cause lobar or segmental shadows.

Of 101 patients presenting lobar or segmental shadows, 51 were subjected to follow-up examination from one to sixteen years after discovery of the shadow. A roentgenogram of the thorax was made and bronchography was done in these 51 cases. In 21 of the patients nothing abnormal was found. In the other 30 the following changes were observed: stenosis of primary, lobar, or segmental bronchus in 12; rigidity or ectasia of the bronchi of a lobe or a segment in 15; deformation of bronchi in 5; marked shrinking of a lobe in 5; hypertrophy of bronchi of other lobes in 5; thickening of the pleura (interlobar) in 7. With one exception, these lesions were found in the upper lobes, the middle lobes, and the lingula. Fifty of the 51 patients had remained without symptoms since their discharge from hospital or sanatorium. Only 1 of them, with bronchiectasis of the left lower lobe, had low-grade fever and râles.

Eighteen roentgenograms.

BERT H. MALONE, M.D.
Brunswick, Ga.

Streptomycin in Pulmonary Tuberculosis: Clinico-Roentgenological Consideration. Alfred J. Ackerman and John H. Moyer. Am. J. Roentgenol. **67**: 383–404, March 1952.

The authors have reviewed 187 cases of pulmonary tuberculosis treated with Streptomycin and have correlated and compared the clinical and roentgenological aspects. They have found, as have other investigators, that the chief value of the drug lies in its ability to cause significant symptomatic improvement and in the effect it exerts on exudative lesions regardless of whether exudation dominates the clinical picture or accompanies caseous or fibrocaseous lesions. Drug fastness, which developed in a great majority of the cases, limited the therapeutic effect.

The authors state that the conventional radiographic classification of individual tuberculous lesions is not accurate, since the distinction between exudative noncaseous and caseating lesions is impossible. The appearance of cavities within the areas of pneumonic infiltration is the only reliable roentgen evidence of caseation. Productive lesions are frequently accompanied by peripheral exudates which are not always large enough to be distinguished radiographically. Progression of a productive focus is inseparable from an initial exudative phase.

Exudative lesions in areas of recent exacerbation usually resorb completely under Streptomycin therapy. In fibrocaseous and productive tuberculosis the drug is useful only to the extent that it usually limits the disease to the parenchyma already involved. The exudative lesions accompanying these forms of tuberculosis absorb less readily than in the predominantly exudative phase. Bronchogenic spread may occur in spite of continued treatment.

In spite of Streptomycin therapy, tuberculous cavities may appear. They are usually seen in tuberculous pneumonias which have progressed to caseation. The drug does not usually modify this. On the other hand, cavities frequently decrease in size and may completely disappear. This is due in part to alleviation of bronchostenosis and in part to the repair process, which may leave a scar at the cavity site.

In conclusion, the authors say that Streptomycin represents a useful adjunct to the accepted methods of treatment in pulmonary tuberculosis, but that alone it is not a definite method of therapy. Prophylactic use of Streptomycin may help obviate such complications as empyema and bronchopleural fistula and thus help extend the surgical treatment of this disease.

Seventeen case histories are included. In one case an aplastic anemia developed, presumably due to the toxic effects of Streptomycin.

Thirty-four roentgenograms.

WILLIAM H. SOMERS, M.D.
Indiana University

Review of Mass Chest X-Ray Surveys. Robert J. Anderson. J.A.M.A. **148**: 605–608, Feb. 23, 1952.

In the past four years the U. S. Public Health Service has participated in fourteen community-wide chest x-ray surveys in which small chest films were obtained on nearly five and one-half million persons.

While it is recognized that mass chest x-ray surveys have definite limitations, due largely to (*a*) variability of interpretation, (*b*) variability of disease patterns, and (*c*) lack of fully definite knowledge of the disease process, many unsuspected lesions have been brought to light through limited surveys. This provided compelling reasons for enlarging the scope of tuberculosis case finding and led to the projects mentioned above.

In an effort to assess the value of mass chest x-ray surveys as a tuberculosis control measure, and to minimize their limitations, the Public Health Service studied the occurrence and spread of tuberculosis within a community following an intensive case-finding program. In the three and one-half years following the initial screening program in Muscogee County, Georgia, average annual death rates from tuberculosis appeared to be about the same for the group receiving x-ray examination and for a group not so examined. This rather disturbing fact is interpreted as signifying that the survey reached the more critical or vulnerable segment of the population, and that, if those vulnerable elements had not been examined, their rate would perhaps have been higher than it was, and higher than the rate in the unscreened (and presumably less vulnerable) population. Another factor is that of the endogenous disease that becomes active within a community after a screening program. The cropping up of active cases from this source between surveys could be reduced by increasing the frequency of surveys, *i.e.*, decreasing the time between resurveys in groups known to be particularly vulnerable or susceptible.

The response of the people to an opportunity for x-ray examination varies from one city to another and with age of the population and the racial groups represented. In general, from 2 to 7 per cent of people surveyed by small films will require confirmatory studies on 14 × 17-inch films. Of those recalled for such study, 80 to 90 per cent respond. On the total number of 14 × 17-inch films taken in the fourteen community-wide surveys to date, the prevalence of findings suspicious of tuberculosis ranged from 0.6 to 2.0 per cent of all persons receiving small-film examinations.

Information assembled by the Public Health Service indicates that about one out of every thousand persons screened will have active tuberculosis. Detailed analysis of five surveys shows that 85 to 90 per cent of these newly found active cases are unknown to the local health department. The identification of these cases represents a major contribution of the community-wide small-film mass chest x-ray survey. Other valuable contributions include the discovery of neoplastic disease of the lungs and, perhaps, the discovery of cardiovascular abnormalities.

The author concludes that, in spite of its limitations, the mass chest x-ray survey has positive value in tuberculosis control, and that progress in study of the method should lead to its even greater usefulness in the fight against tuberculosis in the United States.

SIDNEY KING, M.D.
Hancock, Mich.

Pleural Calcification Resulting from Exposure to Certain Dusts. Adelaide Ross Smith. Am. J. Roentgenol. **67:** 375–382, March 1952.

Of all the "dusty industries," four groups show a conspicuously high incidence of pleural calcifications. These are the groups exposed to the dusts involved in making bakelite insulators, to mica, to calcimine, and to tremolite talc. The incidence is highest in the talc group. Since the calcimine and bakelite insulator industries involve exposure to both talc and mica, it is supposed that these materials may be responsible for the calcifications found in all four industries. Tremolite talc is a calcium magnesium silicate, closely resembling asbestos in its fibrous structure and capable of producing severe pneumoconiosis. Mica is a complex silicate of potassium, aluminum, magnesium, calcium, and fluorine, and it also may cause pneumoconiosis.

Roentgenographically the calcification may vary from a small linear deposit in the region of the diaphragm to massive deposits extending over both lung fields. Among the mica workers a considerable number showed also excessive calcification of the hilar nodes.

An analysis of 14 cases is presented. In 5 of these no other lung lesion was noted; 7 patients had accompanying pneumoconiosis and 2 had active pulmonary tuberculosis. No signs or symptoms could be attributed to the calcific deposits.

Pathologic studies of the lungs of talc workers revealed pneumoconiosis similar to that caused by asbestos. The pleura is the site of dense fibrous tissue with numerous calcified areas.

The pathologic physiology of calcific pleurisy is discussed. It is suggested, on theoretical grounds, that in addition to being able to produce pneumoconiosis and pleural irritation, tremolite talc and mica contain the chemical elements, namely calcium and magnesium, which tend to stimulate calcium deposition.

Twelve roentgenograms.

J. STEWART WHITMORE, M.D.
Indiana University

Diffuse Pulmonary Granulomatosis in Young Women Following Exposure to Beryllium Compounds in the Manufacture of Radio Tubes. Further Observations and Report of Nine Additional Cases. Paul Slavin. Am. Rev. Tuberc. **65:** 142–158, February 1952.

Chronic pulmonary granulomatosis due to beryllium is an incurable disease, resulting in disabling pulmonary insufficiency and often in right heart failure. The nature of the illness was not recognized at first, and a number of victims continued to work in areas where there was exposure to dust containing beryllium. The author presents the findings in 9 cases in addition to 5 reported earlier (Am. Rev. Tuberc. **60:** 755, 1949. Abst. in Radiology **55:** 771, 1950).

Roentgenograms revealed diffuse nodulation in all cases, with conglomeration and varying amounts of fibrosis appearing in many. Giant blebs were also found in all cases and rupture of the blebs with resulting pneumothorax was noted in 4 patients.

No correlation was found between the amount of beryllium in the lung tissue and the extent of the granulomatosis. Prognosis is grave in all cases, but when there is no evidence of cor pulmonale and the granulomatous lesions are stable to x-ray examination, the outlook is somewhat more favorable.

Nine roentgenograms; 2 photomicrographs; 3 photographs.

JOHN H. JUHL, M.D.
Minneapolis, Minn.

Pulmonary Manifestations of Mycosis Fungoides. Samuel M. Bluefarb and Hyman S. Steinberg. Ann. Int. Med. **36:** 625–639, February 1952.

Four cases of mycosis fungoides with the typical skin picture and pulmonary infiltrations discovered on roentgen examination are reported. Three of these cases were verified at autopsy. In the fourth patient the lesions in the lung cleared following treatment with nitrogen mustard and radioactive phosphorus.

The authors quote Werth's description of the typical roentgen-ray picture of mycosis fungoides of the lungs (Arch. f. Dermat. u. Syph. **181:** 299, 1940). "The lesion begins with hilar enlargement, which is not characteristic, followed by spreading of the affection along the vessels and manifested roentgenologically by increased streakings. Later tumorous changes occur, small nodules appearing along the vessels and bronchi, so that the picture resembles bronchopneumonia or lymphangitis carcinomatosa. These changes are characteristic in that the apices remain free until the end, markedly different from the picture seen in tuberculosis." Lung involvement is always associated with a generalized lymph node involvement. The path of infection must be imagined as follows: The infectious agent enters the blood stream, is caught in the lymph nodes, and does not enter the lungs until the breakdown of the hilar nodes. This is confirmed by the observation of hilar swelling in all cases, and the apparent beginning of the lung involvement near the hilus. It is interesting to note the close parallel to Boeck's sarcoid. In both diseases, a positive anergy to the tuberculin test is present.

Four roentgenograms; 2 photomicrographs.

STEPHEN N. TAGER, M.D.
Evansville, Ind.

Pulmonary Changes in Uremia. Hyman E. Bass, David Greenberg, Emanuel Singer, and Milton A. Miller. J.A.M.A. **148:** 724–726, March 1, 1952.

The appearance of pulmonary densities in a patient with uremia seems to be an ominous sign. Eight fatal cases of "uremic lungs" were observed by the authors, and an attempt is made to correlate the clinical, x-ray, and pathologic findings. The changes are non-specific, being due to altered pulmonary capillary permeability.

The pulmonary densities resemble those of tuberculosis, sarcoidosis, pneumoconiosis, fungous diseases, and the various pneumonias.

Although the x-ray picture simulates pulmonary edema, the patients show none of the clinical signs of that condition. Some patients had mild dyspnea, and physical findings in the chest were minimal. In other patients, the roentgen findings were most pronounced, and dyspnea was severe. Hemoptysis may be present. Frequently an enlarged heart shadow is noted. The pulmonary densities are generally extensive but confined to the inner lung zones. Most of the authors' cases showed a "butterfly" distribution, but occasional basal involvement was also seen. Control of decompensation may result in the disappearance of the densities.

This condition is most apt to occur with azotemic stages in glomerulo-nephritic uremia.

Two roentgenograms; 2 photomicrographs.

DONALD DEF. BAUER, M.D.
Coos Bay, Ore.

The Simultaneous Visualization of the Posterior and Anterior Mediastinum After Insufflation in the Peridural Space. Tridimensional Tomographic Study. G. Sansone and A. De Maestri. Acta pædiat. **41**: 101–107, March 1952.

For the simultaneous roentgen visualization of structures of the anterior and posterior mediastinum in children, the authors inject a gaseous contrast medium into the peridural space *via* the intrarachidian extradural route. The child sits in the lumbar puncture position, and a needle, 4 cm. long, with stilet, is introduced between the eleventh and twelfth dorsal vertebrae in the mid-line, as for a spinal puncture, until one has the impression that the ligamentum flavum has been passed. Then, with a large syringe, 50 or 100 c.c. of gas (the authors prefer oxygen) is injected. It is advisable to leave the needle in place in the event more gas is required. The gas escapes through the intervertebral foramina, reaches the loose prevertebral connective tissue, and outlines all the anatomical structures of the mediastinum. After fluoroscopic examination, plain anteroposterior and lateral films and later anteroposterior, lateral and transverse axial tomograms are taken. The maximum quantity of oxygen injected in older children has been 500 to 600 c.c. No disturbances have been encountered except sometimes a slight subcutaneous emphysema in the lateral cervical or dorsal region or a very moderate infiltration in the neck. The gas usually reaches the anterior mediastinum from the posterior mediastinum, giving a marked retrosternal emphysema.

On plain anteroposterior films, the injected gas appears localized in the paravertebral regions as a thin longitudinal stripe. When insufflation is more advanced, the heart border becomes sharply outlined and separated from the diaphragm. In lateral films the cardiac silhouette is clearly defined and well separated from the anterior thoracic wall. The isolated thymus is sunk in the retrosternal emphysema. The aorta is visible throughout its thoracic course, even if partially obscured by superimposed shadows. In anterior tomograms, the thoracic descending aorta, the aortic arch, the pulmonary conus, the ascending tract of the aorta, and the thymus can be visualized on different layers. In lateral tomograms, following the layers from right to left, one sees the branches of the right pulmonary artery, the sharply outlined cardiac silhouette and the ascending aorta, the aortic arch and the pulmonary conus, the thoracic descending aorta, and the branches of the left pulmonary artery. Tomograms in the axial transverse projection are especially interesting, showing the aorta throughout its thoracic course and, in superior layers, the descending vena cava, the innominate, carotid, and subclavian arteries, and the thymus.

The authors believe this technic will find a wide application in the roentgen diagnosis of mediastinal morbid conditions and in the study of congenital heart disease.

Three roentgenograms; 1 drawing.

Mediastinal Gastric Cyst. Successful Excision in an Eight-Week-Old Infant. Mark H. Williams and James F. Johnson. Arch. Surg. **64**: 138–147, February 1952.

Mediastinal gastric cysts are of outstanding surgical importance because without operative treatment they are almost invariably fatal. Unlike other mediastinal cysts, they produce symptoms relatively early and are discovered frequently in the first decade of life.

The authors have found 32 intrathoracic gastric cysts in the literature and report an additional case in a child successfully operated upon at eight weeks of age.

The majority of gastric cysts are located in the region of the middle third of the esophagus, originating in the posterior mediastinum and extending into the right hemithorax. The cyst may have no connection with surrounding structures, but its wall often shows varying degrees of fusion with the adjacent esophagus. No intraluminal connection between the gastric cyst and the esophagus has been noted in any of the reported cases.

Because many of these cysts are actively secretory, progressive enlargement is the rule, and most of the symptoms are due to the enlarging posterior mediastinal mass. Cough, dyspnea, and dysphagia are frequent symptoms. Hematemesis may occur if pressure on the esophagus interferes with its blood supply, causing necrosis of the esophageal mucous membrane. Hemoptysis due to peptic ulceration into a bronchus also occurs.

Roentgenograms show a smooth-contoured posterior mediastinal mass of uniform density which usually, but not always, enlarges to the right. The mass is commonly large and there may be secondary emphysema, atelectasis, pneumonitis, bronchiectasis, or erosion of adjacent ribs.

It is emphasized that these rare cysts are seen in disproportionate numbers in infancy and that they may present an urgent indication for operation.

Three roentgenograms; 1 photomicrograph; 1 photograph.

C. R. PERRYMAN, M.D.
Pittsburgh, Penna.

Some Radiologic Aspects of the Thymus. P. Bétoulières and R. Paleirac. J. de radiol. et d'électrol. **33**: 167–174, 1952. (In French)

In infants and young children the normal or "hypertrophic" thymus may give rise to shadows of interest in differential diagnosis. The thymic shadow may appear bilaterally or on either side of the mediastinum and may be arched, angular, or sail-shaped. It may or may not be continuous with the superior mediastinum, and

may simulate mediastinal tumor, enlarged brachiocephalic, aortic, or pulmonary vessels, or even cardiac enlargement. The thymus is polymorphic and at times is even trefoil or clover-leaf in shape.

[A rare manifestation is a lateral thoracic soft-tissue mass which seems to change shape with the respiratory phase.—C.M.N.]

Seven roentgenograms; 11 drawings.

CHARLES M. NICE, M.D.
University of Minnesota

Transthoracic Removal of Calcified Lymph Node Causing Hemoptysis by Bronchial Erosion. Herbert C. Maier. Am. Rev. Tuberc. **65**: 206–209, February 1952.

Bronchoscopic removal of calcified nodes is often possible when they erode into a bronchus. When surgical removal is indicated, there are often so much associated inflammatory disease and bronchiectasis that part of the lung must also be resected. Occasionally, when there is no pulmonary disease secondary to the stenosis produced by the node, and the eroded bronchus is endoscopically inacessible, the calcified node can be removed by a transthoracic approach without sacrifice of pulmonary tissue. Such a case is presented. Hemoptysis due to the eroding node was the presenting symptom. By means of tomography, accurate localization of the calcified mass was possible and its removal effected a cure.

One tomogram.

JOHN H. JUHL, M.D.
Minneapolis, Minn.

Six Cases of Cystic Pulmonary Sequestration with Abnormal Artery of Aortic Origin. P. Santy, M. Bérard, P. Galy, and Nguyen Huu. J. franç. méd. et chir. thorac. **6**: 101–139, 1952. (In French)

Huber, as early as 1777, published a necropsy study of an anomalous artery originating from the aorta to supply a portion of the right lower lobe, in which a cyst developed. Few examples of this anomaly were reported, however, until Harris and Lewis, in 1940 (J. Thoracic Surg. **9**: 666, 1940), presented a case which was treated by surgery. Since then 51 surgical cases have been collected. The authors report 6 cases.

Some writers postulate a coincident maldevelopment of the bronchopulmonary bed and anomalous vessel while others believe that the bronchopulmonary lesion is secondary to the anomalous artery. The vessel is rich in elastic tissue and takes its origin from the lower thoracic or upper abdominal aorta, the intercostal, phrenic, or suprarenal artery, or the celiac plexus.

The posterior basal segment of the right lower lobe is most frequently involved. The condition is often latent from the clinical standpoint, being discovered incidentally on radiographic or postmortem examination. Occasionally, hemoptysis or symptoms of bronchopulmonary suppuration lead the patient to consult a physician.

Usually the diagnosis is one of conjecture before surgical intervention. It should be suspected when an apparently congenital cystic lesion is seen in the posterobasal segment of either lower lobe. Perhaps angiopneumography or retrograde aortography might be of aid in preoperative diagnosis.

Five roentgenograms; 9 drawings; 2 photographs.

CHARLES M. NICE, M.D.
University of Minnesota

Aneurysm of the Pulmonary Artery Due to Schistosomiasis. Halim A. Zaky. Dis. of Chest **21**: 194–204, February 1952.

There are two varieties of schistosomiasis endemic in Egypt. In one variety, due to *S. mansoni*, the ova are deposited in the intestinal tract, and in the other, due to *S. haematobium*, in the veins of the urinary tract. In the former variety there are complications involving the liver, spleen, and lungs; in the latter variety the complications are mainly urinary.

There are two forms of pulmonary schistosomiasis. In one form migration and death of the worms in the lungs lead to lobular pneumonia. In the other form the ova reach the lesser circulation either from the vesical veins or across a porto-caval anastomosis and are deposited in and around terminal pulmonary arterioles. Only living ova are capable of exciting a histiocytic and a fibroblastic reaction in and around the arteriole, which they are able to penetrate. They may cause an endarteritis obliterans and tubercle formation. Parenchymatous lesions are less frequent than the periarterial. The process is patchy at first but becomes more generalized. It is located in the perihilar areas and in the peripheral portions of the lungs, sparing the apices.

The bilharzial tubercle may end by calcification, and this possibility must be added to other known causes of calcified nodules in the lung.

An obliterative endarteritis also occurs in the vasa vasorum of the large pulmonary artery. This leads to weakening of the arterial wall with subsequent dilatation even in the absence of a constant rise of pressure.

The author saw 6 cases of schistosomal aneurysm of the pulmonary artery during a five-year period, the patients ranging in age from fourteen to fifty-five. Radiography and angiocardiography revealed enlarged right heart and conus, diffuse aneurysmal enlargement and ballooning of the artery and its branches. Hilar dance was present. There was no left auricular enlargement. The lungs showed tortuous beaded vessels, pseudo-honeycombing, and scattered hard nodular mottling more marked in the middle and lower zones.

Ten roentgenograms; 4 photomicrographs; 2 electrocardiograms.

HENRY K. TAYLOR, M.D.
New York, N. Y.

Surgical Treatment of Multiple Arteriovenous Fistulas in the Right Lung in a Patient Having Undergone a Left Pneumonectomy Seven Years Earlier for the Same Disease. Bernard C. Charbon, William E. Adams, and Ralph F. Carlson. J. Thoracic Surg. **23**: 188–196, February 1952.

The authors report the case of a young adult male who had multiple arteriovenous fistulas in both lungs. His father and several other male ancestors were known to have had frequent nosebleeds and blue spots on their lips. One of the patient's sisters died suddenly at an early age, and another one was said to have been "blue" but was not seen by the authors.

The patient complained of frequent nosebleeds and colds for two or three years prior to 1943. In that year a clinical diagnosis of cavernous hemangioma of the left lung was made, partly on the basis of the family history. Laboratory studies showed a high red count and a rather low arterial oxygen saturation. Roentgenographically there was a lobulated, moderately opaque area covering about 25 sq. cm. between the left

seventh and ninth rib posteriorly. A similar opacity of smaller size was seen in the midaxillary line at the level of the right sixth rib. A left pneumonectomy was done in February 1943. The pathologic diagnosis was multiple arteriovenous fistulas of the left lung. Two years later empyema developed from a bronchopleural fistula. Following a thoracoplasty in 1948, for this complication, the patient felt well and continued to work. In 1949 he began to experience some shortness of breath and cyanosis. Pulmonary angiograms showed four cavernous spaces in the lower half of the right chest, the appearance of which was compatible with arteriovenous fistulas. There was marked clubbing of the fingers and toes. The red cell count was over 7,000,000; the hemoglobin 22 gm.; arterial oxygen saturation 69 per cent.

In 1950 an attempt was made to remove the four fistulas demonstrated in the lower right lung. The authors give an interesting and rather comprehensive description of the method used, which included continuous oximeter readings taken during the operation. The tracings showed a sudden rise in oxygen saturation of the blood when the arteriovenous shunts were occluded. A year later the patient was in "fairly good" condition. The reader is referred to the original article for complete discussion of the methods involved.

Twelve illustrations, including 5 roentgenograms; 2 tables. [The roentgenograms, which appear to have been printed backward, show the lungs left for right.]

C. J. CORRIGAN, M.D.
St. Paul, Minn.

Factors Influencing Stroke Volume: A Cinefluorographic Study of Angiocardiography. Robert F. Rushmer and Nathan Thal. Am. J. Physiol. **168**: 509–521, Feb. 1, 1952.

The relation between the effective diastolic filling pressure and the size (area) of the left ventricle was measured by means of cinefluorographic angiocardiography, retrograde left ventricular catheterization, and intrathoracic pressure recording by the method of Wiggers. The effective filling pressure was not the predominant factor in determining the size of the left ventricle during diastole. Increased stroke volume, as judged by changes in the projected area of the left ventricle at the end of systole and diastole, was accomplished by either increased diastolic filling, more complete systolic ejection, or both. When epinephrine was injected with the contrast medium, filling of the ventricle occurred in two stages, the first major increment of blood entering in the early diastolic period under reduced filling and a large supplement in the presystolic period. The striking changes in filling and ejection of the ventricle produced by epinephrine suggest the following working hypothesis:

1. In the normal heart, the distensibility of the ventricular musculature is characteristic of the myocardium, which is markedly influenced by the quantity of epinephrine-like substances within the ventricular wall.

2. An increase in distensibility of the ventricle permits an increase in diastolic filling with no change or even a reduction in venous pressure.

3. Thus, the level of venous pressure is regulated by the distensibility of the ventricles so long as the heart operates within a normal range.

4. The upper limit of the "normal range" of the diastolic size is the point at which the connective tissue stroma begins to exert tension. If the ventricle distends beyond this level, the elasticity of the connective tissue must be overcome by increased effective filling pressure, and the diastolic filling becomes more directly related to venous pressure.

It is proposed that the diastolic size of the ventricular chambers is determined by the effective filling pressure only under abnormal conditions such as cardiac decompensation and in animals specially prepared for the study of the action of the heart muscle (heart-lung preparation).

Eight illustrations.

Electrokymography. I. The Ventricular Electrokymogram. II. The Great Vessel and Auricular Electrokymograms. Simon Dack and David H. Paley. Am. J. Med. **12**: 331–348, March 1952; Ibid. 447–471, April 1952.

This report on electrokymography is very complete and detailed. For those with special interest in this subject, a careful study of the original is recommended.

The first paper begins with a description of the normal ventricular curves, indicating the need for careful technic in performing the study and the importance of a knowledge of the normal variations and possible errors.

The changes in various pathologic states are elaborated. The ventricular electrokymogram is of particular value in myocardial infarction, whether this be anterior, posterior, or basal. The findings tend to remain longer and will be found when the electrocardiogram has returned to normal. The ventricular electrokymogram may yield valuable information, also, in conditions such as hypertensive heart disease, coronary sclerosis, constrictive pericarditis, myasthenia gravis, and congenital heart disease. Involvement of the entire heart in pulsus alternans is clearly demonstrated by this means. It is also a useful tool in the study of the normal physiology of the heart.

The second paper deals with the movements of the atria and great vessels. The electrokymographic findings in valvular heart disease are of great physiologic significance. The phenomenon of the atrial systolic plateau in mitral and tricuspid regurgitation may become a useful method of evaluating the apical systolic murmur.

In congenital heart disease the electrokymograph promises to be helpful in studying the status of the pulmonary artery circulation, particularly if the instrument is successfully calibrated, as now appears to be the case. Investigations at present in progress hold great promise that two of the most urgently needed clinical tests of cardiac function may be solved by electrokymography, namely, simple determinations of cardiac output and pulmonary artery pressure. Success in these fields would replace cumbersome, costly, and hazardous technics by a relatively simple procedure.

In bundle-branch block, Wolff-Parkinson-White syndrome, and the various cardiac arrhythmias, the electrical and mechanical events of the cardiac cycle can be correlated. Observations are presented concerning the relationship between length of diastolic interval, interval between auricular and ventricular systole, the strength and amplitude of cardiac contraction, and the intensity of the heart sounds.

It is pointed out that the method can be of diagnostic aid in differentiating mediastinal and lung tumors from vascular or cardiac aneurysm.

In the authors' opinion, the results presented in these

reviews justify further intensive studies with the electrokymograph. Continued study will eventually simplify the instrument, expand its usefulness, and provide another valuable aid in the investigation of cardiac physiology and disease.

One roentgenogram; 28 electrokymograms.

PAUL W. ROMAN, M.D.
Baltimore, Md.

Foreign Bodies in the Heart. Indications for and Technic of Removal with Temporary Interruption of Cardiac Blood Flow. Henry Swan, James H. Forsee, and Edwin M. Goyette. Ann. Surg. **135:** 314–323, March 1952.

The arguments in favor of removal of cardiac foreign bodies may be summarized as follows: (1) to prevent embolism of the foreign body or of a thrombus associated with it; (2) to reduce the danger of bacterial endocarditis; (3) to prevent recurrent pericardial effusions; (4) to diminish the incidence of myocardial damage, with subsequent myocardial aneurysm and rupture; (5) to prevent injury to coronary arteries; (6) to prevent or cure an occasional psychoneurosis due to knowledge of the presence of the foreign body in this vital organ. On the other hand, many patients with foreign bodies in the heart remain essentially asymptomatic for months to years after their initial injury.

Perhaps only one conclusion may be readily drawn from the literature. Under current conditions, with advances in anesthesia, transfusion, antibiotics, and surgical technic, the deliberate removal of intracardiac foreign bodies is attended by a very small mortality risk. This contribution is concerned chiefly with the operative indications and surgcal procedure, including a description of a new incision in the fourth interspace, from the anterior axillary line on the right to the anterior axillary line on the left, and a discussion of temporary interruption of the blood flow to the heart to allow intracardiac manipulations in a dry field.

One of the primary considerations for operation is the *exact* location of the foreign body, and to determine this angiocardiography is indispensable. The exposure of choice is the left anterior oblique, which silhouettes the interventricular septum. Other views may be desirable for demonstrating fragments at a distance from the ventricles.

Two cases are presented with almost identical foreign bodies in the interventricular septum, illustrating the application of the recommended indications for surgical intervention. In these cases in the regular anteroposterior and lateral films exact location could not be established, and the two foreign bodies appeared to be almost identical in size and position. Angiocardiography, however, clearly demonstrated the crucial difference between the anatomical location of the two fragments. In Case 1, the foreign body lay wholly within the interventricular septum; in Case 2, it protruded significantly into the right ventricle.

Eight roentgenograms; 1 photograph.

BERT H. MALONE, M.D.
Brunswick, Ga.

Detection of Heart Disease in a Mass Chest X-Ray Survey for Tuberculosis Case-Finding. Daniel Porte. Ann. Int. Med. **36:** 603–606, February 1952.

The use of screening technics developed in other areas of public health work has been advocated for the control of cardiovascular diseases. A typical survey recently conducted by the Queensboro (N. Y.) Tuberculosis and Health Association, in which roentgenograms of the chest of 6,579 persons over fifteen years of age were made in mobile units using 70 mm. film, was selected for the present study. The films were read by a team of specialists who had had considerable experience. Abnormality of the heart was suggested by 87 of the roentgenograms.

Of the 87 persons, 19 were found on further examination to have heart disease previously unknown; 26 had cardiovascular disease previously known, and 25 were found to be free of organic heart disease. Of these 25, 9 were found to have essential hypertension on the basis of blood-pressure readings exceeding 150/100 mm. Hg. The remaining 17 persons did not report for examination.

These findings compare favorably with the productivity of the survey from the point of view of tuberculosis case-finding. A total of 126 persons was recalled because of suspected pulmonary disease. Of these, 9 were found to have active tuberculosis and 72 cases were diagnosed as arrested, apparently cured, or questionable tuberculosis.

The cases of heart disease, both known and unknown, included 32 of hypertensive and arteriosclerotic heart disease, 12 of rheumatic heart disease, and 1 of arteriosclerotic heart disease without hypertension. Most of the cases of rheumatic disease were previously known, whereas more than half the cases of hypertensive arteriosclerosis were discovered for the first time through the chest survey.

Previously unknown cases of hypertensive arteriosclerosis were found in every age group over twenty-four years. However, since the sample of persons examined followed roughly the population curve, findings of arteriosclerosis among people over fifty-five years of age were proportionately higher than among younger people.

Of the 30,072 persons who had chest films taken in the Queensboro Tuberculosis and Health Association's $1 X-ray Service during 1949 and 1950, slightly more than 1 per cent were recalled for pulmonary follow-up and approximately 2.5 per cent for investigation of abnormal cardiac shadows.

In the author's experience with 70-mm. chest films, abnormalities in the contour of the cardiac shadows proved to be more significant than apparent enlargement of the heart.

Three tables.

STEPHEN N. TAGER, M.D.
Evansville, Ind.

Heart Disease and Mass Miniature Radiography. M. I. Bostock and William Morris. Canad. M. A. J. **66:** 126–127, February 1952.

It has been shown by Mathiesen *et al.* (Am. Heart J. **39:** 505, 1950. Abst. in Radiology **56:** 457, 1951) and by others that an appreciable number of cases of heart disease can be detected by mass miniature radiography surveys where the primary object is the unmasking of pulmonary tuberculosis. While miniature films can be misleading in the detection of borderline cardiac enlargement, a sufficient number of cases of heart disease can be detected to make follow-up worth while.

The present report is regarded as a sequel to that of Mathiesen. It is a summary of the findings in a survey covering a wide range of the population of Greater Vancouver. From December 1950 to May

1951, 34 cases of arteriosclerotic or hypertensive heart disease, 16 cases of valvular heart disease, and 7 cases of congenital heart disease were found. Causes for apparent abnormalities in hearts which later proved normal were (1) obesity, (2) prominent pulmonary conus, (3) pregnancy, and (4) achondroplasia.

Five tables.

JOHN M. KOHL, M.D.
Jefferson Medical College

Left Atrial Enlargement. The Optimum Roentgen Method for Its Demonstration. Harold G. Jacobson, Maxwell H. Poppel, Irwin B. Hanenson, and Stephen B. Dewing. Am. Heart J. **43**: 423–436, March 1952.

The authors studied, in various projections, 50 cases, 49 of rheumatic heart disease with mitral involvement and 1 of arteriosclerotic heart disease, and concluded that the left lateral erect projection is superior to the right anterior oblique for the demonstration of the pressure effect of an enlarged left auricle upon the esophagus. In this projection, slight enlargement of the left auricle is more readily recognized and it can be differentiated from the left ventricle.

The lower two-thirds of the esophagus are anterior and to the right of the descending aorta. As the auricle enlarges, it first indents the esophagus, then displaces it posteriorly and to the right, less often to the left. This indentation is visible in the middle third of the esophagus.

In 39 of the 50 cases studied, the left lateral projection was superior to the right anterior oblique. In 6 of these the right anterior oblique projection did not demonstrate the left auricular enlargement. When, however, the enlargement was visible in the right anterior oblique view, it could always be seen in the lateral projection, and usually to better advantage. In 8 cases the enlargement appeared about the same in both projections, and in only 3 instances did the oblique projection appear superior to the lateral.

The left lateral projection is also of value in determining left ventricular enlargement producing pressure upon the lower third of the esophagus.

Nineteen roentgenograms; 1 table.

HENRY K. TAYLOR, M.D.
New York, N.Y.

Detection and Identification of Intracardiac Calcifications. J. E. Habbe. Dis. of Chest **21**: 268–279, March 1952.

For the study of intracardiac calcifications, the author uses fluoroscopy and orthodiagraphy, obtaining, in addition to teleroentgenograms and esophagrams, multiple high-speed, aimed spot roentgenograms. For these last, four exposures are made on a 10 × 12-inch film, the position of the patient being changed slightly for each exposure, thereby aiding greatly in differentiating intracardiac and extracardiac calcifications.

In a clinic or practice where upper age groups predominate, calcifications of the annulus fibrosus, the aortic valve, and the coronary arteries will occur with greater frequency than mitral valvular, myocardial, or pericardial calcifications. In the author's series of some 100 patients with intracardiac calcifications, the incidence of cases due to coronary arteriosclerosis exceeded the combined total incidence of valvular, myocardial, and pericardial deposits.

Pericardial calcifications are for the most part accidental findings; they are usually associated with symptoms of constrictive pericarditis and are usually located over the ventricles. Myocardial calcifications occur in infarcts, the commonest location being the apical portion of the left ventricle. Annulus calcifications are recognized fluoroscopically by their large dancing excursions; on kymography, a wide movement in the opposite direction of the cardiac apex is apparent. The mitral annulus is usually an incomplete ring and appears as a reversed C or U shape. When it appears as a complete ring, the calcification is present in the interventricular septum. In the postero-anterior projection, aortic leaflet calcifications are higher and more medially placed than mitral leaflet calcifications. The author has also demonstrated calcareous plaques in the coronaries where none were demonstrable in the aorta.

Nineteen roentgenograms.

HENRY K. TAYLOR, M.D.
New York, N.Y.

Radiographic Images of an Intracardiac Gas Embolus. Gernez-Rieux, Bonte, and Mereau. J. franç. de méd, et chir. thorac. **6**: 268–269, 1952. (In French)

During angiocardiography to determine the vascular connections of a bronchogenic cyst of the left base the apparatus of Dos Santos was being used. An assistant failed to arrest the injection, and the oxygen under pressure, which serves to propel the liquid, was introduced into the cardiac cavities. Seven or eight seconds later, after two roentgen exposures had been made, the patient became unconscious. At the same time gas was seen to escape at the site of venous puncture. The patient's head was lowered, but clonic movements and stertorous respiration became evident. After thirty seconds in the head-down position, consciousness returned, and respirations became regular. A state of shock remained for about twenty-five minutes. The next morning, fifteen hours after the examination, the only remaining symptom was a temperature of 38.5°C.

Two roentgenograms are reproduced. One shows gas in the superior vena cava, while the second shows gas in the right atrium and in the pulmonary arteries. Recovery was attributed to the immediate lowering of the head and to the fact that oxygen is easily absorbed.

CHARLES M. NICE, M.D.
University of Minnesota

Constrictive Pericarditis Caused by Solitary Metastatic Carcinoma of the Pericardium and Complicated by Radiation Fibrosis of the Mediastinum. S. R. Slater, I. G. Kroop, and S. Zuckerman. Am. Heart J. **43**: 401–412, March 1952.

A case of chronic constrictive pericarditis produced by diffuse metastatic carcinoma of the pericardium is presented. The pericardial carcinoma was the only metastasis from a primary breast carcinoma completely resected fourteen years previously. Postoperative x-ray therapy had been administered to the left parasternal area and to the left axilla. A cough began soon after the irradiation was completed and was attributed to pulmonary fibrosis of the left lobe. Aside from the chronic persistent cough, the patient remained well for fourteen years. She then consulted a physician because of increasing dyspnea and a feeling of pressure in the upper abdomen of seven months duration. The liver edge was felt 4 fingerbreadths below the right costal margin. Ascites was present. There was a marked pitting edema of the lower extremities. Digitalization and mercurial diuretics were effective in reducing the weight from 151.5 to 129 pounds. The liver, however,

remained enlarged. The diagnosis of constrictive pericarditis was suspected, and the patient was hospitalized.

Unusual clinical features were severe dyspnea, jaundice, and electrocardiographic changes indicating an active pericardial injury. A roentgenogram of the chest showed fibrosis of the left upper lobe with pulling of the superior mediastinum to the left, a sharp-edged density overlying the heart near the spine, and pleural effusion. An adhesion extended from the left leaf of the diaphragm to the left hilus. The heart did not appear to be enlarged, but its contour was distorted and pulled slightly upward and to the left. The patient died during surgical exploration.

At necropsy the epicardium was found to be thickened and studded with tumor nodules. The parietal pericardium was similarly involved; it was diffusely and firmly adherent to the epicardium and completely obliterated the pericardial cavity. The authors believe that the irradiation contributed to the fibrosis but was not responsible for the constrictive pericarditis. The constrictive encasement of the heart was produced by the scirrhous stromal reaction to the tumor cells. The pulmonary and mediastinal fibrosis secondary to the roentgen therapy complicated and obscured the diagnosis.

Eight illustrations, including 1 roentgenogram.

THE SPINAL CORD

Dumbbell (Hourglass) Neurofibromas Affecting the Spinal Cord. J. Grafton Love and Henry W. Dodge, Jr. Surg., Gynec. & Obst. **94**: 161–172, February 1952.

In thirty-five years (1914–50) about 1,000 tumors of the spinal cord of all types were operated on at the Mayo Clinic. About 29 per cent were neurofibromas, and of this group 60 were of dumbbell or hourglass shape and affected the spinal cord. An early diagnosis of these tumors is of utmost importance, as surgical removal can produce gratifying and rapid recovery. In the present series, the location of lesions was as follows: cervical 26, thoracic 21, lumbar 11, and sacral 2. The peak incidence was at thirty-one to forty years, with no sex predilection. Numbness and weakness of the extremities, pain, and sphincteric difficulties were the most common symptoms. The average duration of symptoms was about four years for the cervical and thoracic, seven years for the lumbar, and ten years for the sacral tumors.

Positive or suggestive roentgenographic evidence of tumor was present in 40 patients. These findings included enlargement and erosion of intervertebral foramina (the most frequent and characteristic roentgen finding) and erosion of pedicles, laminae, spinous processes, and ribs. Spinal fluid analysis was helpful, usually showing an elevated total protein. In 15 problem cases, contrast myelography was performed and 11 localizations were possible with radiopaque oil.

Once the diagnosis is suspected, differentiation must be made from other spinal cord tumors and lesions arising from nearby structures.

A discussion of the surgical approach is included, with an analysis of the results. These were good in 53 patients, fair in 5, and poor in only 2.

Twelve figures, including 4 roentgenograms; 2 tables.

Z. S. GIERLACH, M.D.
University of Louisville

THE DIGESTIVE SYSTEM

Spontaneous Rupture of Thoracic Esophagus: Its Surgical Cure. Walter F. Bugden. Am. J. Surg. **83**: 225–227, February 1952.

Spontaneous rupture of the esophagus is relatively uncommon. If the condition is not correctly diagnosed and treated, death soon occurs. With prompt diagnosis and surgical intervention, most of these patients should be saved.

A case is reported in a 57-year-old woman who was admitted to the hospital with a diagnosis of ruptured peptic ulcer. A scout film of the abdomen was taken to determine the presence or absence of subphrenic air (in perforated peptic ulcer free air is said to be present beneath the diaphragm in 4 out of 5 cases). No air was visible, but an increase in density above the left diaphragm posterior to the heart was noticed. A chest roentgenogram was then obtained, which showed a definite hydropneumothorax plus mediastinal emphysema. Methylene blue was given by mouth and immediately recovered by thoracentesis in the left eighth interspace. Within six hours of the onset of her illness the patient was operated upon. A rent some 1.5 cm. in diameter was found in the left lateral wall of the esophagus and was closed. Convalescence was uneventful.

Three roentgenograms.

Tracheoesophageal Fistula: Value of Immediate Diagnosis, with Report of a Case. Gerald N. Weiss and C. J. Miangolarra. J.A.M.A. **148**: 732–734, March 1, 1952.

A newborn infant with excessive salivation and frothy mucus which persists despite repeated aspirations should be suspected of having a tracheo-esophageal fistula. Even before the child leaves the delivery room a small catheter can be passed into the esophagus. If the catheter meets an obstruction, x-ray studies with a small quantity of iodized oil will immediately rule out or definitely establish the presence of a fistula.

A case is presented in which early recognition of the anomaly permitted surgical treatment when the infant was six hours old. Early diagnosis and immediate surgery provide an opportunity for definitive treatment before complications such as pneumonitis and dehydration can develop.

Three roentgenograms.

DONALD DEF. BAUER, M.D.
Coos Bay, Ore.

Invagination of the Mucous Membrane of the Esophagus into the Stomach. R. Sarasin and A. Hoch. Schweiz. med. Wchnschr. **81**: 1207–1209, Dec. 8, 1951. (In German)

A good deal has been written in the last few years about invagination of the mucous membrane of the stomach through the pylorus. Much less common is invagination of the mucous membrane of the esophagus into the stomach. It seems to occur mostly in patients who have a hiatus hernia of the stomach. The authors have observed 3 cases, 1 of which they describe in detail.

The patient was a 54-year-old man who had difficulty in swallowing and occasional acute retrosternal pain during eating. He also complained of increased salivation and some slight weight loss. In the course of a

year several gastrointestinal x-ray examinations were made. These revealed a small hiatus hernia of the stomach and, at the junction between the esophagus and the stomach, a filling defect which from a radiological standpoint was quite characteristic of a prolapse of the esophageal mucosa through the cardia. At times this condition could be seen; at other times it seemed to have disappeared. As the possibility of cancer could not be entirely eliminated, an exploratory operation was done, and a true prolapse of the mucous membrane of the esophagus through the cardia was observed. Various adhesions were severed, the stomach was brought back into its normal position within the abdomen, and a subsequent check-up x-ray examination showed a normal esophagus.

Two roentgenograms; 2 drawings.

WM. A. MARSHALL, M.D.
Chicago, Ill.

Pharmaco-radiography of the Stomach and Duodenum. Guy Albot. Am. J. Digest. Dis. **19:** 82–88, March 1952.

Pharmacoradiography, as described in this paper, involves the use of the pharmacodynamic action of certain substances to modify the behavior of the stomach and thus improve the quality of radiographic exposures and add to their instructiveness. Sedatives, such as atropine and papaverine, may prove useful in relaxing spasm of the pylorus, but hypertonic substances, notably morphine and insulin, are of the greatest service, stimulating the musculature of the stomach, ensuring a better molding of parietal lesions, accentuating the mucosal relief, and thereby making clearer abnormalities which could be no more than suspected on the standard series of radiographs.

These substances cause a gastric hypertension and a hyperkinesia of the stomach, with rapid peristaltic waves, often of a violent nature. Due to this hypertension, the cap and second portion of the duodenum are relatively atonic, and in cases where only a skeleton cap is visualized by ordinary methods, good visualization is obtained and deformities are well shown. The same technic will generally make possible demonstration of lesions of the pyloric canal and prepyloric antrum. It facilitates, also, detection and study of suspicious signs of incipient gastric cancer, either by showing up the superficial erosions, such as the plateau-shaped niche and the niche in an arc-shaped space, by emphasizing the contrast between certain infiltrated rigidities and the supple wall of the stomach, or by allowing the mucosal relief around these lesions to be studied for signs of malignancy, such as the convergence of permanent, abnormally large folds ending in a club shape.

The author gives the details of administration of the drugs. He regularly uses insulin, reserving morphine for cases in which it is desirable to produce a very violent hypertension, particularly of the muscularis mucosae.

It is emphasized that this method of examination is a supplementary procedure and should not in any event replace routine methods. The use of the drugs may be contraindicated by poor physical condition of the patient. After the administration of insulin a small amount of sugar should be given to prevent a reaction.

Twelve roentgenograms.

JOSEPH T. DANZER, M.D.
Oil City, Penna.

Influence of Carbonated Water on Gastric Emptying. Giorgio Lolli, Leon A. Greenberg, and David Lester. New England J. Med. **246:** 490–492, March 27, 1952.

The rate of gastric emptying was measured by two methods. In some individuals gastric evacuation was determined by fluoroscopy, with a semisolid test meal, and in others by direct measurement of the gastric content, with the aid of a Levine stomach tube and a bouillon test meal. For the fluoroscopic technic each person received a test meal of farina and barium sulfate followed by either water or carbonated water. Frequent fluoroscopic observations were made until no barium shadow was visible in the stomach. This time was considered the complete gastric emptying time.

Ingestion of carbonated water definitely hastened gastric emptying. In the group studied by the fluoroscopic method, gastric emptying was seen to be appreciably faster after administration of carbonated water, while under direct measurement, gastric volumes fell off rapidly as compared with that in subjects receiving uncarbonated water.

Previous studies on the effect of carbonated beverages on gastric emptying are apparently in some disagreement. This seems to stem from the use of heavily mineralized carbonated beverages or of sodium bicarbonate to produce carbon dioxide by reaction with the acid gastric juice. The effect of the salts present in the first instance could not be properly evaluated, and in the latter the effect would depend on the amount of acid in the gastric contents.

Four tables.

JOHN F. RIESSER, M.D.
Springfield, Ohio

"Profile Line" in Roentgenologic Differentiation of Intrinsic and Extrinsic Lesions of the Stomach. Everett L. Pirkey, Edsel S. Reed, William H. Smith, and Gabriel Whiteman. J.A.M.A. **148:** 1095–1097, March 29, 1952.

The authors outline a method for the roentgenologic examination of the upper half of the stomach. When the routine studies show a possible abnormality in this area, the patient swallows an ordinary stomach tube to the end of which is tied an inflatable latex balloon. The balloon is inflated under fluoroscopy, with the pressure not exceeding 20 mm. mercury. The effect of varying stages of inflation in various positions is then studied. Stereoscopic right anterior and left posterior oblique views are routinely obtained.

This procedure supplies information as to the elasticity, mobility, and motility of a portion of the stomach usually inaccessible to palpation. The stereoscopic views, because of the splinting action of the balloon, aid greatly in the study of the mucosa of the upper half of the stomach. The "profile line," consisting of a thin layer of barium sulfate trapped between the distended balloon and the smoothed-out normal mucosa, is of significance. The line is absent if the mucosa is roughened by an infiltrative process; it continues smoothly over extrinsic masses and over extramucosal intramural tumors that have not ulcerated. The procedure has been especially valuable in the "false positive" cases, in which suspicious deformities have been ironed out or shown to be due to extrinsic masses.

The authors reported their findings with this technic in 54 cases, in Am. J. Roentgenol. **67:** 217, 1952 (Abst. in Radiology **59:** 913, 1952).

Eight roentgenograms.

D. D. ROSENFELD, M.D.
Fontana, Calif.

The Gastrointestinal Tract in the Aged. Sidney A. Portis and Joseph C. King. J.A.M.A. **148:** 1073–1079, March 29, 1952.

The authors made a study of 133 ambulatory patients over sixty years of age with gastrointestinal complaints unaccounted for by any organic disease. They reach the conclusion that the symptoms and laboratory and x-ray findings in this group show less correlation than in younger persons. Eighty patients had symptoms referable to bowel habits, 59 having some form of constipation. Distress in the upper abdomen, consisting of heartburn, distention, and belching, was the next most frequent complaint. Gastric analysis was performed in 113 patients; the incidence of histamine-free achlorhydria was 9.8 per cent, which is about the same as the frequency of achlorhydria in the population as a whole. None of the patients with achlorhydria had an abnormal hematologic picture and, contrary to the findings of some writers, the emptying time of the stomach was normal.

The most common incidental structural abnormality found on x-ray examination was diverticulosis of the colon (34.6 per cent), occurring most frequently in the sigmoid loop. Seventy-nine patients showed coarsening of the small bowel pattern. Other incidental findings included: duodenal diverticula, 10 cases; deformed duodenal cap, 7 cases; hiatal hernia, 10 cases; esophageal diverticula, 2 cases; gallstones in a visualized gallbladder, 19 cases; poor gallbladder visualization, 10 cases. There was no correlation between bowel habits and motility of the small intestine. Gastric and intestinal motility in general was about the same as in younger persons.

Some psychological reasons for symptoms in the upper and lower parts of the abdomen are outlined. Treatment, including psychotherapeutic, dietary, and medicinal considerations in old persons, is described.

[This study should interest the radiologist who feels inadequate when reporting negative findings in elderly people with troublesome gastrointestinal complaints.—D.D.R.]

Five tables.

D. D. ROSENFELD, M.D.
Fontana, Calif.

Radiological Studies of the Alimentary Tracts of Undernourished German Children. F. R. Berridge and Kathleen M. Prior. Brit. J. Radiol. **25:** 145–151, March 1952.

The stomachs and small intestines of 154 undernourished German children five to fourteen years of age were examined radiologically. No significant alteration in the stomachs was observed. The motility of the small intestine was normal. In 105 the mucosal pattern of the small intestine was also normal. The remainder showed segmentation and flocculation.

Forty-one of the children were again examined a year after the addition of unlimited amounts of bread fortified with calcium, as well as concentrates of vitamins A, C, and D, to the "German rations." [The meaning of "German rations" is not specified, but in the new diet 70 to 75 per cent of the calories came from the bread.] No significant changes were noted. Those who were normal in the undernourished state remained normal. Those showing segmentation and flocculation still showed flocculation.

Twelve other children were re-examined after a year on a diet containing considerable amounts of fat and sugar, as well as bread. Gastric emptying times were not significantly changed, but transit times in the small intestine were definitely prolonged.

Twelve roentgenograms.

SYDNEY J. HAWLEY, M.D.
Seattle, Wash.

Foreign-Body Perforations of the Gastrointestinal Tract. A Report of Six Cases. Lester Persky and Edward D. Frank. New England J. Med. **246:** 223–224, Feb. 7, 1952.

Six cases of perforation of the gastrointestinal tract by a foreign body are reported. In none was the foreign body demonstrated roentgenographically and in none was the diagnosis made prior to operation. Four of the cases involved the large bowel.

One roentgenogram.

Contribution to the Differential Diagnosis of Tumors Along the Greater Curvature of the Stomach. O. Walther. Schweiz. med. Wchnschr. **81:** 1211–1214, Dec. 8, 1951. (In German)

Sharply defined smooth filling defects along the greater curvature of the stomach are mostly produced by benign leiomyoma, malignant leiomyosarcoma, benign or malignant polyps with a broad base, and adenocarcinoma. Of these, the benign leiomyoma is the most common. Roentgenologic differentiation of these tumors is difficult or even impossible. Some suggestion as to the diagnosis may be obtained, however, by a careful study of the mucous membrane. If the rugal pattern in the region of the lesion shows a normal structure, if signs of rigidity are absent, and if an error through superimposition of normal mucous membrane from the opposite side of the stomach can be excluded with certainty, then there is a probability that the tumor is benign. If, however, the mucous membrane shows an atypical structure, if it is net-like in appearance, and if the rugal folds are rigid and thickened, then there is a possibility of leiomyosarcoma or of a carcinoma, even if the defect is sharply outlined.

The gastroscopic examination is not too helpful in the differential diagnosis for the following reasons. Leiomyomas and also malignant leiomyosarcomas take their origin in the submucosa and in the muscularis of the wall of the stomach, showing an expansive growth. The mucous membrane remains intact for a long time, and only in the late stages can mucosal infiltration be demonstrated. Carcinoma also may show an atypical expansive growth below the mucous membrane, leaving it intact for a considerable period.

The author cites 3 cases that were originally reported by Americans (Lowman *et al.*: Am. J. Roentgenol. **57:** 726, 1947. Abst. in Radiology **50:** 558, 1948). To these he adds a case of his own in which the microscopic examination revealed malignant degeneration of a broad-based polyp.

Five roentgenograms; 1 photograph; 1 drawing.

WM. A. MARSHALL, M.D.
Chicago, Ill.

Mesenchymal Tumors of the Stomach. Gladden V. Elliott and Hugh M. Wilson. Arch. Int. Med. **89:** 358–367, March 1952.

The mesenchymal group of neoplasms consists of lymphosarcomas, leiomyomas, leiomyosarcomas, fibromas, neurofibromas, and lipomas. Of these, the lymphosarcomas and leiomyomas are by far the most

important in both frequency and clinical significance. Lymphosarcomas accounted for 14.3 per cent of all gastric neoplasms in a total of 5,183 examinations made by the authors during a period of eighteen months. During the same period, 5 clinically significant leiomyomas of the stomach, representing an additional 4.2 per cent of all gastric neoplasms, were discovered.

Leiomyoma: The ages of the 5 patients with leiomyoma ranged from thirteen to sixty-five years, and the duration of symptoms from three months to two years. All of the patients presented either symptoms or signs of gastrointestinal bleeding. Ulceration was common, probably as a result of necrosis due to inadequate circulation when the tumor reaches a certain critical size. Two of the 5 patients had large ulcer craters; only 1 complained of ulcer-like symptoms, and he had a hiatus hernia, which may have been responsible for his dyspepsia. Only 1 patient had a palpable abdominal mass, although 2 others had large masses demonstrable on roentgen examination.

The characteristic roentgen findings in gastric leiomyoma are: (1) demonstration of a sharply circumscribed, smooth, intraluminal filling defect, with or without an associated soft-tissue mass projecting beyond the contours of the stomach; (2) abrupt obliteration of gastric rugae over the tumor, with preservation of normal architecture in the immediate suorrunding area; (3) preservation of pliable gastric walls and peristaltic activity; finally (4) ulceration in the central portion of the tumor in some cases. Rigler and Ericksen (Radiology **26:** 6, 1936) stressed the value of administration of small amounts of barium, compression, and over-penetration of the roentgenogram; this suggestion proved helpful in the authors' experience. Differentiation of leiomyoma from other intramural lesions and wide-based adenomatous polyps is sometimes difficult.

Lymphosarcoma: In contrast to the relatively well defined clinical and roentgenologic picture presented by the leiomyomas, the manifestations of lymphosarcoma are definitely protean.

The age range, symptomatology, and clinical findings in the authors' 10 cases of *primary lymphosarcoma of the stomach* are practically identical with those in patients suffering from carcinoma. Pain and bleeding were frequent complaints in spite of the supposed submucosal nature of the tumors. Large or multiple ulcerations were found in 6 of the 8 cases in which surgical specimens were studied. Gastroscopy was of little aid in the 2 cases in which it was performed, although in 1 case the possibility of lymphoma was suggested. Unfortunately, in only a small percentage of cases does diffuse thickness of the stomach occur, producing the so-called characteristic roentgen picture of lymphosarcoma. All 10 cases were diagnosed roentgenologically as carcinoma of the stomach, and in only 2 instances was the possibility of lymphosarcoma suggested. The differentiation of carcinoma and lymphosarcoma and the differentiation of the less common, diffuse type of lymphosarcoma from diffuse hypertrophic gastritis may be impossible from the roentgenographic or gastroscopic findings.

In the authors' series there were 7 cases of *generalized lymphosarcoma with secondary involvement of the stomach.* In age range and presenting gastrointestinal complaints these were similar to the primary lymphosarcoma group. Pain, weight loss, a mass, and bleeding were common to both types. One of the 7 cases of secondary lymphosarcoma presented symptoms of acute perforation of a sarcomatous ulcer. The secondary lymphosarcomas offered less difficulty in roentgenologic differentiation; by proper correlation of all clinical and roentgen findings, a correct diagnosis was made in all 7 cases.

Twenty-two roentgenograms; 1 photograph.

Carcinoma of the Stomach. B. F. Swynnerton and S. C. Truelove. Brit. M. J. **1:** 287–292, Feb. 9, 1952.

Follow-up studies of one to thirteen years were done on 375 patients treated for carcinoma of the stomach in a twelve-year period (1938–49). About half of the group were admitted within six months of the first symptom. The commonest site (58 per cent) of the tumor was at the pyloric end of the stomach; only 12 per cent were in the cardia. Indigestion was the most frequent complaint. An epigastric mass was palpable in nearly half of the patients at the time of hospital admission. In 90 per cent of the series the radiologist reported an abnormality at the first examination. In 7 per cent he did not interpret this as suggestive of carcinoma; in 83 per cent he was evidently able to state that the lesion was probably malignant. Normal or unusually acid secretions were found in 25 per cent and are not regarded as constituting an adequate basis for exclusion of carcinoma.

Resection offers the only hope of prolonged life. Sixty-three per cent of this group were operated upon, but in only 30 per cent was resection done. The outstanding factor in prognosis is the length of the history. Prognosis is better for the group with a long history of symptoms, though this seems contrary to our entire concept of seeking to find gastric cancer early in the hope of cure. The explanation lies in the fact that long survival appears to depend not so much upon treatment as it does upon the rate of growth of the malignant lesion. Patients with a long history are patients with slowly growing cancer and they survive longer even after admission late in the recognizable course of their disease.

Two charts; 13 tables.

DONALD DEF. BAUER, M.D.
Coos Bay, Ore.

Linitis Plastica Carcinoma of the Stomach with Extensive Metastases Simulating a Colonic Lesion. Edwin R. Fisher and Charles H. Brown. Gastroenterology **20:** 503–508, March 1952.

A single case of linitis plastica carcinoma of the stomach is presented in which the symptoms were referable to the colon, the chief complaint being a diarrhea of eighteen months duration. Despite widespread involvement of the wall of the stomach, there were no gastric symptoms.

X-ray studies of the colon revealed a smoothly marginated narrowed segment at the splenic flexure. Examination of the stomach was normal except for enlarged rugae. The most tenable preoperative diagnosis was segmental colitis, although a possible carcinoma of the colon, of the linitis plastica type, was considered.

At operation, undertaken because of obstructive symptoms, and seven days later at autopsy, a diffuse thickening of the gastric wall was found. A similar process involved the gallbladder, ascending, transverse, and descending colon, with extreme narrowing at the

splenic flexure. The gastric mucosa was irregular, with edematous rugal folds. The wall was thick, measuring 0.5 to 1.5 cm.

Their case, the authors feel, illustrates the difficulty of demonstrating carcinoma of this type roentgenologically and raises the question as to whether the "mass survey" technic of x-raying the stomach for cancer will ever be practical.

Four roentgenograms; 2 photographs; 1 photomicrograph. RICHARD A. ELMER, M.D.
Atlanta, Ga.

Gastric Polyps. Harry Yarnis, Richard H. Marshak, and A. I. Friedman. J.A.M.A. **148:** 1088–1094, March 29, 1952.

The authors review 73 cases of gastric polypoid adenomas diagnosed *in vivo* and 30 additional cases found in 8,735 routine autopsies. These include only benign epithelial proliferative tumors. Cases of inflammatory hyperplasia developing from gastritis (pseudopolyps) are not considered.

In the series reported, bleeding and abdominal pain were the most prominent complaints. In 50 of the 55 patients tested achlorhydria was found. An atrophic mucous membrane was present in 38 of 42 cases examined gastroscopically. Thirty-seven patients had multiple adenomas. Malignant transformation could be demonstrated in 2 instances.

Roentgenologically adenomas are visualized as rounded, smooth, translucent filling defects that may produce a widening and displacement of the normal rugal folds. There is no interruption of the gastric contour or peristalsis. Adenomas less than 0.5 cm. in diameter may be difficult to differentiate from rugal folds, particularly when the folds are seen on end. Lesions on the greater curvature are especially likely to be overlooked, because here the rugal folds appear much thicker. Also, excessive secretions may make identification of adenomas difficult. Air bubbles or particles of food may be a source of confusion.

Rarely an adenoma may produce an intussusception of the stomach into the first or second portion of the duodenum by traction on the mucosa. On the other hand, large prolapsing folds from the antrum into the duodenum may simulate polyps. The mushroom shape of these folds in the duodenum and their variability on repeated examination will identify prolapsed mucosa.

The authors usually employ small amounts of barium for mucosal relief studies in the search for adenomas, but occasionally the tumor will be shown more clearly in a barium-filled stomach. It is important to use gentle compression, because too much pressure will obliterate the outline of a soft polyp. Rarely the contour of a soft polyp will change under varying degrees of compression. When the patient is muscular or obese, the adenoma may be found more easily by making roentgenograms in the supine position with the left side elevated, thus affording an air-contrast study.

Management of the patient with a gastric adenoma depends on symptomatology, the multiplicity of the lesions, and their gastroscopic appearance. If the adenoma is solitary and less than 1 cm. in diameter, and "if the gastroscopic appearance is definitely that of a benign lesion," conservative therapy with follow-up examinations every six months is justifiable. If there is any question about the benignity of the polyp, if the adenoma is large, or if it produces symptoms either of bleeding or obstruction, excision is indicated. When a large number of polyps is present, a high subtotal gastrectomy is usually recommended, since gastroscopic observation of the individual lesions is difficult or even impossible.

Five illustrations, including 2 roentgenograms; 3 tables. D. D. ROSENFELD, M.D.
Fontana, Calif.

Radiologic, Operative, and Pathological Findings in a Series of Cases of Gastric Polyp. Piero Gambaccini. Radiol. med. (Milan) **38:** 217–238, March 1952. (In Italian)

The author reports on 15 gastric polyps observed at the Radiological Institute of the University of Florence and discusses the radiologic appearance and the operative findings in each case. Of particular interest are 2 cases in which polyps were demonstrated much better by insufflation of the stomach with air than by barium filling.

Thirty roentgenograms; 4 photomicrographs; 4 photographs. CESARE GIANTURCO, M.D.
Urbana, Ill.

Demonstration and Significance of the Pedicle in the Roentgen Diagnosis of Polypoid Tumors of the Alimentary Tract. Barton R. Young and Robert L. Scanlan. Pennsylvania M. J. **55:** 225–226, March 1952.

Recognition of the pedicle is particularly important in the diagnosis and localization of small polypoid tumors of the alimentary tract because it indicates the true nature of the lesion and rules out artifacts such as fecal particles and air bubbles. Not all polypoid tumors have pedicles or stalks, but a careful fluoroscopic study, supplemented by spot-film radiography, often reveals the pedicle of a tumor that is otherwise not apparent. The most common manifestation of a tumor is a filling defect seen fluoroscopically in the head of the barium column as it coats and fills the involved portion of the bowel.

After artifacts are ruled out by compression and manipulation, a careful search for the pedicle should be made. Once demonstrated, the pedicle is separated from the tumor by optimal rotation of the patient and traction on the tumor. Fluttering of the tumor in the barium stream is another positive finding and is pathognomonic of a pedicle.

In order to detect a small tumor of the colon, it is essential that the bowel be clean. Castor oil should be given at 4:00 P.M. the day before the examination, followed by cleansing enemas the night before and the morning of the study. Spot films are supplemented by prone and supine 14 × 17-inch roentgenograms, obtained before and after evacuation and after air insufflation. Variation in the length of the pedicle and changes in the configuration of the colon may make the exact localization of the polyp difficult.

Three roentgenograms.

JOSEPH T. DANZER, M.D.
Oil City, Penna.

Significance of Postoperative Examinations Following Partial Gastrectomy and Gastroenterostomy. J. Oberholzer. Schweiz med. Wchnschr. **82:** 182–185, Feb. 16, 1952. (In German)

On the basis of 350 postoperative examinations, the author concludes that following partial gastrectomy

and gastroenterostomy the gastric pouch should empty in one hour. The anastomosis should be at the most dependent point, and it should be wide.

Gastritis following partial resection may be caused by reflux of duodenal and biliary secretions into the stomach. The gastritis may involve the entire gastric pouch or may be limited to the anastomosis. [No description is given of the pattern of the gastric mucosa in this type of gastritis.]

Should a delay in gastric emptying time develop, with severe clinical symptoms in the immediate postoperative period, revision of the anastomosis is imperative. On the other hand, a similar delay of emptying time without clinical symptoms requires no surgical intervention.

Eight roentgenograms. ILONA D. SCOTT, M.D.
VA Hospital, Chamblee, Ga.

Roentgen Study of the Resected Stomach with Albumin and Fat Barium Tablets (A Roentgen Test of Digestion). A. Leb. Fortschr. a. d. Geb. d. Röntgenstrahlen **75:** 106–116, (Sonderheft) December 1951. (In German)

The present article deals with a unique manner of investigating postoperative symptoms in the partially resected stomach (with no residual ulceration). Symptoms are caused by: (1) lack of hydrochloric acid and ferment reaction as a result of resection of a large part of the stomach for ulcer, with decrease in metabolization of food; (2) change of reflex and the chemical interrelationship between stomach secretion and gallbladder and pancreatic function; (3) pathological gastric motility and abnormal speed of emptying, with decreased passage time in the small intestine.

Tablets were prepared with an outside layer of fat, albumin, or carbohydrate. The disintegration time of these tablets may be accurately determined by serial x-ray exposures. Since the usual albumins and globulins were found unsuitable for this purpose, a preparation of rabbit muscle (actomyosin) was used. After many trials, a coating 0.8 mm. in thickness was found to be most satisfactory. Such tablets will dissolve in an alkaline solution.

Tablets with a coating of fat 0.8 mm. thick will dissolve in an alkaline solution. There will therefore be no disintegration within the stomach unless there is considerable regurgitation of bile and duodenal secretion. Normally the tablets disintegrate in the small bowel in one to two hours. If they can be recognized in the colon, considerable digestive disturbance is indicated.

The individual cases were studied as follows: (1) gallbladder examination; (2) digestive test of the remaining portion of the stomach and the intestinal tract; (3) the usual barium meal study, with special reference to the condition of the anastomosis; (4) motility test to reveal possible disturbance in emptying time and progress throughout the gastrointestinal tract. One-third of the patients observed were pain-free and showed normal digestion following subtotal gastrectomy. Another third were definitely improved, with increased digestion time of fat in the intestinal tract and changes of motility. The remainder had pain and progressive physical deterioration.

Twenty-one roentgenograms; 1 photograph. E. W. SPACKMAN, M.D.
Fort Worth, Texas

Gastric Ulcer with Multiple Gastro-intestinal Diverticula. A. I. Friedman. J. M. Soc. New Jersey **49:** 52–55, February 1952.

The author presents the case of a 71-year-old man with diverticula of the esophagus, duodenum, jejunum, and colon. There was also demonstrated roentgenologically a projection on the lesser curvature of the stomach near the cardio-esophageal opening. Because gastric diverticula are common in this location, the lesion was thought to be another diverticulum. The roentgen pattern and the symptomatology, however, were unusual for diverticulum and a gastric ulcer could not be excluded. The lesion disappeared with appropriate ulcer therapy, and at the time of the report the patient was completely free of symptoms.

Two roentgenograms.

Twenty-Six Cases of Asymptomatic Duodenal Ulcer. P. A. Rechnitzer and J. H. Geddes. Canad M.A.J. **66:** 231–232, March 1952.

Twenty-six patients attending the Gastrointestinal Clinic of Westminister Hospital, London, Ontario, were found at some time in the course of their treatment to be asymptomatic while showing radiological evidence of an active ulcer. At first, it was thought that the radiologic diagnosis must have been incorrect. Later, it became apparent that there is a group of patients who have an asymptomatic, active duodenal ulcer with positive x-ray findings. The 26 cases are reviewed and the patients are classified with respect to: (1) duration of symptoms, if any had ever been present; (2) age; (3) radiographic visualization; (4) complications; (5) gastric acidity; (6) discovery of the ulcer.

Aside from the fact that the patients had an active lesion while free of symptoms, nothing was found to set them apart from a random group with the ulcer syndrome.

Two tables. JOHN M. KOHL, M.D.
Jefferson Medical College

Roentgenologic Diagnosis of Peptic Ulcer, with Special Reference to Percentage Incidence of Duodenal Ulcer in Routine Gastrointestinal Examinations. Samuel G. Henderson. Pennsylvania M. J. **55:** 147–150, February 1952.

Peptic ulcers may occur in the lower end of the esophagus, stomach, duodenum, jejunum, and even, infrequently, in Meckel's diverticulum. They are most often found in the duodenum.

Ulcer of the esophagus usually occurs just above the cardiac end of the stomach and produces a deformity similar to that seen in the latter organ. It may be associated with aberrant gastric mucosa. Autopsy series show an incidence of 0.13 per cent.

Simple gastric ulcer is commonly found near the lesser curvature. Its incidence in various autopsy series is 1.5 to 5 per cent.

Gastrojejunal or jejunal ulcer after gastroenterostomy is often difficult to find. One must scrutinize carefully the mucosal pattern with a very small amount of barium. If present, the ulcer may be found just proximal or just distal to the jejunal stoma.

Ulcers of the duodenum are encountered more frequently in males than in females in the proportion of 4 to 1. They are rare in infancy and childhood and usually occur between the ages of thirty-five and sixty. The ulcer is usually on the lesser curvature side of the

bulb in either the posterior or anterior wall. The most common complaint is pain in the epigastrium with food relief. The niche or crater seen in frontal projection and/or in profile is convincing evidence of ulcer. Occasionally, however, even with careful fluoroscopy and roentgenography, the ulcers do not show. Where this occurs and the history is suggestive, one should repeat the examination, as the ulcer may be filled with a blood clot or food. The stoma may be extremely small or the spread of barium may be so thick that an ulcer on the posterior wall will not show through a frontal projection and the position of the patient may be such that the crater is not visible on the several oblique films. At times the bulb is so irritable that barium cannot fill the ulcer, under which circumstances a repetition of the examination becomes necessary.

The author believes that the incidence of duodenal ulcer is on the increase. It is his opinion that this is partly due to the present world upheaval, but increasing experience in gastrointestinal tract examinations and improved x-ray equipment account for more frequent diagnosis.

Two graphs.

JOSEPH T. DANZER, M.D.
Oil City, Penna.

Post-Bulbar Duodenal Ulcers. Eric Samuel. South African M. J. **26:** 121–125, Feb. 16, 1952.

Post-bulbar ulcers present a number of features which set them apart from the ordinary duodenal ulcer. The patients average ten years older, though the author's opinion is that this is due, at least partly, to delay in diagnosis. Pain bears an inconstant relation to food, its periodicity is not marked, radiation to the back and right scapular region is a constant feature, nocturnal pain is marked, and relief from alkalis is only transient. Another clinical feature is proneness to hemorrhage, either frank or occult. Obstructive symptoms are not marked even in those cases with long histories, and strictures of the duodenum apparently do not occur.

Radiologically the location of the lesion makes it difficult to demonstrate, especially when a normal bulb is seen and post-bulbar ulceration is not suspected. Compression is difficult to apply because the ulcer is usually on the posterior wall of the duodenum and the post-bulbar segment is directed backward. The author found that gravity gave the best filling, with the patient lying on his right side rotated a little toward the prone or supine position, depending on the individual case. The crater itself can usually be demonstrated, but at times the associated spasm is so great that not enough barium is retained. In this event, the amount and persistence of the spasm should cause one to suspect an ulcer. Reflex pylorospasm is sometimes present.

Duodenal diverticulum is the main consideration in differential diagnosis. The salient features suggesting this condition are the smooth outline, absence of associated duodenal spasm, and the presence of mucosal folds entering the diverticulum. Annular pancreas and tumors should also be considered, but their differentiation is not too difficult.

Twelve cases are briefly presented.

Fourteen roentgenograms; 2 drawings.

ZAC F. ENDRESS, M.D.
Pontiac, Mich.

Duodenal Obstruction Due to Pressure of Superior Mesenteric Vessels. Richard C. Shrum. J.A.M.A. **148:** 550–551, Feb. 16, 1952.

Chronic obstruction of the duodenum is rarely encountered in adults, though an occasional case due to pressure by the superior mesenteric vessels has been recorded. It is possible that this obstruction is brought about by such factors as (1) the branching of the superior mesenteric artery off the aorta in an unusually low position, (2) a short vessel, or (3) visceroptosis. Today, with adequate roentgenologic aid, this condition is a recognized clinical and pathological entity.

A case is reported of obstruction of the distal part of the duodenum by the superior mesenteric vessels, producing dilatation of the stomach and vomiting. The condition was relieved by gastrojejunostomy.

One roentgenogram.

Mucosal Relief Study of Small Intestine. W. Deucher. Schweiz. med. Wchnschr. **81:** 1194–1196, Dec. 8, 1951. (In German)

The author has studied the small intestine not only during the routine roentgen examination but particularly by taking films of exposed loops during operation following the administration of a barium mixture. In that manner he has been able to observe changes in the mucosal pattern as well as alterations in the thickness of the bowel wall, etc.

The mucous folds of the small intestine are heavier in the jejunum than in the ileum. In a relaxed wide section of the bowel, the folds are arranged transversely. If the bowel contracts strongly, the arrangement is longitudinal; in a partially contracted bowel, an oblique position is assumed. Alterations in this general pattern are indicative of disease. The mucosal pattern of a normal bowel shows regular and delicate folds. These can be studied to advantage on films of the bowel obtained during hernia operations.

Congestive changes, due to decompensated heart diseases, will produce a broadening of moderate degree in the mucosal folds in the small intestine, but the autoplastic function and motility of the bowel will be well preserved. There will be areas of relaxation alternating with areas of normal strong contraction. The pattern is regular, and spotty wall deposits are not observed.

Tumors of the small intestine produce strong and characteristic changes in the mucosal pattern. In the section of the bowel involved by the tumor, the mucous folds are missing altogether and, instead, an irregularly distorted and markedly narrowed lumen can be seen, which may present barium protrusions due to ulcerations, etc. Such changes may also be seen in severe inflammatory conditions. The latter, however, usually extend over a large section of the bowel, while a tumor involves only a relatively small section.

The changes in the mucosal pattern in inflammatory lesions correspond in severity to the gravity of the disease. A mild acute enteritis seldom produces changes in the mucosal pattern. Changes in the tonus, however, are observed. The passage of barium may be accelerated or slowed down, and there may be abnormal accumulations of gas. In a subacute or chronic enteritis of medium degree, there will be a broadening of the mucosal folds, and patchy barium deposits may be seen along the walls of the bowels. There may be a disturbed change-over of the mucosal folds during contractions, and the contractility of the bowel may be

diminished. Accumulations of gas or of mucus may prevent the adherence of the barium to the wall of the bowel and, under these conditions, observation of a mucosal pattern may be impossible. The secretion of mucus may loosen up the contrast material, which may then assume a patchy, granulated appearance. Such changes can also be found in diseases of the small intestines due to parasites and in various metallic poisonings (lead). The most severe inflammatory changes are those of tuberculosis and regional ileitis. In severe cases, the mucosal pattern may be badly distorted, with irregular broad folds following an atypical course. There may be rigidity of the bowel wall and ulceration. The differential diagnosis between a malignant tumor and tuberculosis may be difficult, but tuberculosis almost always involves the cecum also.

The so-called deficiency pattern is characterized by great variability. There may be swelling and thickening of the mucosal folds. Patchy deposits of barium may occur along the walls of the bowel. Very often the barium is loosened up by mucus, giving it a somewhat granular appearance. However, as the changes are not of an inflammatory nature, there are never any ulcerations or wall infiltrations. A smooth lining of the small intestines may be observed and may be caused by atrophy of the mucous membrane.

An intestinal allergy can occasionally be demonstrated by adding the substance to which the patient is believed to be allergic to the barium meal. Usually, alterations in the rapidity of the passage of the barium and the caliber of the bowel, and increased mucous folds, are indicative of an allergy.

Eight roentgenograms. WM. A. MARSHALL, M.D.
Chicago, Ill.

Roentgenological Examination and Treatment of Chronic Jejunitis. Case Report. O. W. Husebye. Acta radiol. **37**: 162–165, February 1952.

This is a single case report stressing the value of roentgen examination of the small intestine as a diagnostic procedure and illustrating the favorable use of irradiation in chronic jejunitis. The patient was aged fifty-four, with steatorrhea and significant loss of weight. Initial roentgen studies showed heart, stomach, duodenum, and colon to be normal. The jejunum was irregular in contour and the opaque medium was retained in the abnormal loops. The appearance was suggestive of an inflammatory origin. Laparotomy showed nearly a meter of jejunum tubularized and edematous, with surface inflammatory changes. A lymph-node biopsy showed chronic lymphadenitis, but Hodgkin's disease or reticulosarcoma could not be excluded.

A total of 1,800 r (air) was administered to the involved loops of jejunum through a 10 × 15-cm. portal, at 170 kv., with 1 mm. Cu filtration at 40 cm. distance. Improvement began in fourteen days, and eight months after the beginning of irradiation the patient was discharged in a satisfactory state of health.

The author does not suggest that irradiation be used to the exclusion of other modalities in jejunitis. In fact, he urges the use of antibiotics in the acute phase.

Four roentgenograms. JOSEPH P. TOMSULA, M.D.
Baton Rouge, La.

Functional Obstruction of Efferent Loop of Jejunum Following Partial Gastrectomy. Ross Golden. J.A.M.A. **148**: 721–724, March 1, 1952.

Final evaluation of the results of gastric surgery depends not only on the patient salvage effected but also upon the presence or absence of complicating symptoms postoperatively. An apparently functional obstruction of the efferent loop of the jejunum has repeatedly been noted following partial gastrectomy. This often commences eight to twelve days after surgery and is heralded by complaints of epigastric fullness, nausea, and vomiting. The remaining proximal portion of the stomach, or stomach pouch, does not produce normal peristaltic waves and must therefore empty primarily by gravity.

The radiological examination after partial gastrectomy should be done in the morning with the patient erect behind the fluoroscopic screen after fasting overnight. In the Polya type of anastomosis the efferent loop leads out from the lesser curvature, and stomach pouch emptying is delayed. In the Hoffmeister type of anastomosis the efferent loop leads away from the greater curvature side and emptying is more rapid.

When postoperative symptoms develop, differentiation must be made between unsatisfactory function of the anastomosis and actual mechanical or paralytic ileus, in which distention of the small intestine distal to the efferent loop occurs.

In functional obstruction of the efferent loop, gastric secretions, bile, and pancreatic juice accumulate in the stomach pouch, as noted on x-ray examination after an overnight fast. The barium may not pass into the efferent loop. If a little barium passes through, the lumen of the efferent loop is seen to be narrow, one-fourth or less its usual caliber for a distance of several centimeters. This is a functional obstruction resulting from spasm. It disappears spontaneously in a few days in a majority of cases, and in two or three weeks in a minority.

The spasm of the efferent loop is apparently due to a localized temporary disturbance in muscle function, secondary to surgical trauma to the jejunum. The smaller the incision in the jejunal wall, the less likely is this syndrome to appear postoperatively.

Seven roentgenograms.

DONALD DEF. BAUER, M.D.
Coos Bay, Ore.

Volvulus of the Cecum. John J. Byrne, Charles C. Swift, and George E. Farrell, Jr. Arch. Surg. **64**: 378–383, March 1952.

The subject of volvulus of the cecum is reviewed briefly, and 3 proved cases are presented. A correct preoperative diagnosis can be made from a roentgenogram of the abdomen. The characteristic findings are: (1) a markedly dilated loop of cecum and ascending colon, which usually assumes a transverse position in the middle or upper abdomen, and (2) the absence of a large-bowel gas pattern in the normal location of the cecum. In addition, small bowel loops may be seen in unusual locations in the right upper quadrant.

A barium enema examination is not usually necessary and should not be employed as a routine procedure.

Two roentgenograms. RICHARD A. ELMER, M.D.
Atlanta, Ga.

Adenomatous Polyps of the Colon and Rectum: A Challenge in Cancer Prophylaxis. William E. DeMuth, Jr., Paul J. Cherney, and William T. Fitts, Jr. Surg., Gynec. & Obst. **94**: 195–199, February 1952.

Carcinoma of the colon and rectum is probably the

most common type of cancer in males and the third most common type in females. Since a high percentage of these tumors have their origin in adenomatous polyps, the diagnosis and removal of these latter lesions offer a unique opportunity in the prophylaxis of cancer.

At the Hospital of the University of Pennsylvania, accuracy in the diagnosis of polyps has increased markedly in recent years. In the eight years between January 1943 and January 1951, 234 patients with adenomatous polyps of the colon or rectum were seen in the Surgical Clinic of that institution. Approximately two-thirds of the polyps were within reach of the 25-cm. sigmoidoscope. Bleeding was the only symptom considered specific for polyps. It occurred in half the patients.

Fifty-four per cent of the polyps were originally found either by digital examination or by the use of the 25-cm. sigmoidoscope; 31 per cent were discovered only at operation, but this was believed to be due in large part to failure to examine the colon proximal to a cancer for fear of causing a complete obstruction.

In view of the frequent multiplicity of polyps the authors emphasize the importance of routine contrast studies following operation for carcinoma or proctosigmoidoscopic demonstration of a polyp. Special roentgenologic technics are highly sensitive in detecting small polyps of the large bowel, but these are frequently overlooked in ordinary barium enema examinations. In the authors' experience polyps were most frequently missed by ordinary barium enema examination under the following two conditions: (1) When the polyp was in the distal 25 cm. of the large bowel. Polyps were missed by barium enema in 62 per cent of a group of patients in whom the diagnosis was made by proctosigmoidoscopy. (2) When the polyp was associated with a carcinoma of the bowel. In this series an ordinary barium enema examination detected polyps in only 26 per cent of the patients who had a polyp associated with carcinoma.

Contrast barium enemas should be given in all patients who have carcinoma of the large bowel. In many instances these examinations are contraindicated preoperatively, but must be routinely performed postoperatively.

Thirty-six per cent of the patients with polyps in this series had an associated carcinoma of the colon. Malignant changes were noted in 15 per cent of the polyps examined.

If, at the time of operation, invasion of the bowel wall is demonstrated, the bowel should be resected in the region of the polyp. Reoperation is necessary if invasion, missed at the operation, is discovered on pathological examination.

One drawing; 1 chart.

LAWRENCE A. DAVIS, M.D.
University of Louisville

The Diagnosis and Surgical Management of Gall Stone Ileus. Robert M. Levine and Charles B. Ripstein. Canad. M. A. J. **66**: 113–116, February 1952.

Obstruction of the bowel by a gallstone is rather uncommon. It is rarely diagnosed preoperatively and the tendency to temporize in the treatment has contributed to the high morbidity and mortality reported.

There are two ways in which a gallstone may enter the intestinal tract: first, through the cystic and common duct, and second, *via* an internal biliary fistula between the gallbladder and bowel. The necrotizing action of a large stone, aided by increased intraluminal pressure, is responsible for erosion through the gallbladder wall with abscess formation, adhesions, fistula formation, and penetration of the stone into the bowel.

Mechanical obstruction may occur as a result of volvulus about the obstructed point. Perforation is fairly common and may be due to erosion of the gut wall at the site of impaction, or to distention of the dilated proximal bowel. The caliber of the small bowel decreases progressively in a caudad direction, and in most instances, therefore, obstruction takes place in the region of the ileocecal junction or terminal ileum.

X-ray examination may reveal one or more of the following findings: (1) evidence of acute or subacute small intestinal obstruction (in all cases), (2) an opaque gallstone within the bowel lumen, (3) air or contrast medium in the biliary passages, indicative of a cholecystenteric fistula, (4) a stone previously observed in the gallbladder displaced into the intestinal tract.

Four cases are reported and the surgical management of the condition is described.

Two roentgenograms; 1 drawing.

JOHN M. KOHL, M.D.
Jefferson Medical College

Annular Pancreas. Richard Shippen Silvis. Ann. Surg. **135**: 278–283, February 1952.

The author presents a case of annular pancreas in which definitive surgery was successfully performed and tabulates all 26 cases of surgically treated annular pancreas that have been reported.

Annular pancreas is probably the only congenital anomaly of the gastrointestinal tract which usually produces symptoms late in life, although duodenal obstruction occasionally occurs within a few days after birth. Approximately 40 reported cases have been discovered incidentally at autopsy.

A definite preoperative diagnosis of annular pancreas is dependent upon careful roentgenologic examination and an evaluation of the complete clinical picture. The radiographic appearance is that of a smooth-filling defect on the dextral aspect of the second portion of the duodenum. The author stresses the value of serial radiographic exposures in demonstrating the characteristic filling defect. Clinical findings, such as the absence of occult blood in the stool and lack of the usual stigmata of malignant neoplasm, aid in differentiating the anomaly from carcinoma of the duodenum.

In view of the hazard of a pancreatic fistula and the possibility of recurrent duodenal obstruction following resection of the pancreatic ring, the author regards duodenojejunostomy or a posterior gastrojejunostomy as the operative procedure of choice.

Two roentgenograms; 2 photographs; 1 table.

J. FRANKLIN WALKER, M.D.
VA Hospital, Chamblee, Ga.

Accessory Lobes of Liver and Their Significance in Roentgen Diagnosis. Hilliard J. Katz and A. Justin Williams. Ann. Int. Med. **36**: 880–883, March 1952.

Anomalous or accessory lobes arising from the right lobe of the liver are rare and give rise to special diag-

nostic problems. The authors report a case of a 61-year-old white female complaining of alternating diarrhea and constipation of four months duration. Fluoroscopic and roentgenographic examination of the chest revealed a large rounded mass in the right lower lung field posteriorly, with obliteration of the right costophrenic sulcus. The posterior half of the right diaphragm was elevated slightly, lagged during respiration, and moved paradoxically on forced respiration. Following the intraperitoneal injection of 350 c.c. of air, films taken in expiration and inspiration, in the upright position, showed the mass to be subdiaphragmatic. It was found on transthoracic exploratory operation to be approximately 15 cm. in diameter, firm in consistency, covered by a thin fibrous layer of diaphragm, and attached to the right lobe of the liver by a pedicle approximately 10 cm. in diameter. The mass was excised and the diaphragm repaired. The microscopic appearance was that of functioning liver, and the final diagnosis was segmental eventration of the right diaphragm with an accessory lobe of the liver.

In the differential diagnosis of an anomalous lobe of the liver, the history, physical examination, and laboratory findings are of paramount importance. Gummas should be associated with a positive serologic test for syphilis and inflammatory lesions should be accompanied by a febrile illness. Malignant or benign tumors are difficult if not impossible to differentiate. Pneumoperitoneum remains the fundamental procedure for distinguishing between a lesion of the diaphragm, an intrathoracic tumor, and a lesion of the liver. It does not, however, offer a means of distinguishing tumor from an accessory hepatic lobe, which may be done only by macroscopic or microscopic examination. If a liver abscess is the cause of a protrusion of the diaphragm, adhesions are usually present, preventing the entry of air into the subdiaphragmatic space.

Two roentgenograms. STEPHEN N. TAGER, M.D.
Evansville, Ind.

The Shadow of the Liver, Right Kidney and Soft Parts in Cholecystography. František Bílek. Acta radiol. et cancerol. bohemoslovenica **5**:160–166, 1952. (In English)

In addition to the gallbladder and biliary passages, the cholecystogram will show the shadow of the liver, the right kidney, and the soft tissue of the abdomen (abdominal wall and lumbar musculature).

If the angle of the external lobe of the liver is greater than 60°, this may be evidence of liver enlargement. Such an increase in the angle is, according to the author's experience, often accompanied by a negative or faint cholecystographic shadow. This may sometimes give evidence of liver damage.

The shadow of the right kidney is particularly dense in cholecystography, with repeated filling with full doses of dye if the patient abstains from fluids. It is thus possible to recognize an enlarged kidney (hydronephrosis, tumor), displaced kidney (dystopia, ptosis), and an abnormally shaped kidney (horseshoe kidney).

The ileopsoas muscle is the most clearly seen of the lumbar musculature; far less frequently the sacrospinalis is visible (4–5 per cent). The layers of the oblique abdominal muscles are seen in the lateral wall of the abdomen. These soft-part shadows may simulate the margin of the kidney, gallbladder, or a tumor.

Six roentgenograms.

The Gallbladder: Comparison of Roentgen and Pathologic Findings. P. E. Russo and C. J. Cavanaugh. South. M. J. **45**: 232–234, March 1952.

The authors report a statistical study of 1,000 consecutive cholecystograms demonstrating the diagnostic accuracy that cholecystography has attained. In this series, 130 cases came to surgery, furnishing an opportunity for the correlation of the roentgen and pathologic diagnoses. There is usually little chance for error in the diagnosis of stones. The greatest error usually occurs in the case of the poorly visualized or non-visualized gallbladder.

Seven poorly functioning gallbladders were operated upon, and all contained stones. Stones were found at surgery, also, in all but 3 of 65 cases of non-functioning gallbladder; 2 gallbladders showed a chronic cholecystitis without stones, and 1 gallbladder was normal, with an associated advanced cirrhosis of the liver. In the cases of non-functioning gallbladder it is always necessary to rule out pyloric obstruction, hepatic disease, vomiting, or some error in the instructions to the patient. When an exacting technic is followed carefully, a correct diagnosis can be made in a high percentage of cases.

A gallbladder which appears to be normal in films taken in the prone position should be checked by additional views with the patient upright or in the transabdominal position in an attempt to detect gravel or very small stones.

The authors have discontinued the routine use of the fatty meal.

One table. JOHN M. KOHL, M.D.
Jefferson Medical College

Cholelithiasis Not Recognized by Cholecystogram. Gershon J. Levin. Virginia M. Monthly **78**: 652–654, December, 1951.

It is generally agreed that the absence of a gallbladder shadow in cholecystography is pathognomonic of an abnormal state in the biliary tract, and in the majority of instances the gallbladder is diseased. Feldman is quoted as having found non-filling to be due to stones in 90 per cent of cases, while Case's figure is 73.4 per cent. Other conditions which may cause non-filling are peptic ulcer, achlorhydria, and carcinoma of the gallbladder.

The author emphasizes the fallacy of depending upon indefinite cholecystograms when a patient has persistent symptoms indicating gallbladder disease. The visualization of gallstones establishes the diagnosis, but the possibility of their presence in spite of negative cholecystography makes it necessary to remember that the essential point in the diagnosis may be a typical history alone.

Several illustrative cases are presented.

FRANK T. MORAN, M.D.
Auburn, N. Y.

The Nonvisualized Gall Bladder. Francis Martin and Antonio G. Massimiano. New England J. Med. **246**: 488–490, March 27, 1952.

A series of 232 patients undergoing cholecystectomy was reviewed. In 145 of these, a cholecystographic diagnosis of calculi had been made and in 140 calculi were found at operation. In 14 cases the roentgen report was negative or indefinite, and stones were found in 3 of these.

In 73 patients the gallbladder was not visualized

roentgenologically. Calculi were found in 60 patients in this group. Definite gallbladder disease was present in 8, including 3 acute edematous gallbladders and 3 strawberry gallbladders. Five gallbladders showed no significant disease. Non-functioning gallbladders coming to operation, therefore, show a high incidence of stones and an even higher percentage of gross disease.

Under certain circumstances, gallbladders may be erroneously reported as diseased. Attention to technical details of proper ingestion and absorption of the contrast material and a thorough understanding of the physiologic basis of the mobilization and concentration of the medium in the gallbladder will improve the roentgenologic interpretation of the non-visualized gallbladder, so that diagnostic accuracy should approach 100 per cent.

The authors advise (1) careful instructions to patients and inquiry into all non-visualization cases to be certain that instructions were followed; (2) repeat cholecystographic studies in all cases of non-visualization; (3) delay in studies in acute cases; (4) careful check of the medication the patient is receiving; (5) administration of some fat to patients on a fat-free diet, about six hours prior to examination, to ensure an empty gallbladder that can receive the medium.

JOHN F. RIESSER, M.D.
Springfield, Ohio

Spontaneous Cholecystoduodenostomy: Report of a Case of Long Standing. I. R. Jankelson and J. J. O'Conner. Am. J. Digest. Dis. **19**: 66–68, March 1952.

Cholecystoduodenostomy is the most common form of internal fistula. It may be the result of an operation to shunt bile around an occluded common duct or it may occur spontaneously secondary to cholecystitis and cholelithiasis with erosion of a stone or stones into the duodenum. It is less frequently due to cancer of the gallbladder. The danger of an ascending cholangiohepatitis after cholecystoduodenostomy has probably been exaggerated, as shown by the following case.

A 63-year-old white female was referred to the Gastrointestinal Clinic of the Boston City Hospital because of epigastric distress. Ten years previously she was awakened at night by severe epigastric pain, requiring morphine for its relief. At the time no x-ray examination was made, and after a few weeks on a low-fat diet the patient recovered. Since that time she had experienced discomfort, bloating, and belching after dietary indiscretions and had had two or three attacks of severe pain. On roentgen examination the barium passed readily into the duodenal bulb, then into what appeared to be a shrunken, contracted gallbladder, and thence *via* the cystic duct into the common duct and the biliary radicles, which were almost completely filled. The mucosal pattern of the duodenal loop showed no disease process. It is believed that the original episode of pain represented an acute gallstone colic, with development of a spontaneous cholecystoduodenostomy at that time, though this point cannot be established with certainty.

The authors state that a definitive diagnosis of spontaneous cholecystoduodenostomy can be made by x-rays only when free air is seen in the biliary radicles or, more dramatically, when barium given by mouth fills the gallbladder, extrahepatic and intrahepatic ducts. Surgical repair is the treatment of choice.

Two roentgenograms. JOSEPH T. DANZER, M.D.
Oil City, Penna.

Papilloma of the Gallbladder. Report of Eight Cases. Charles F. Kane, Charles H. Brown, and Stanley O. Hoerr. Am. J. Surg. **83**: 161–164, February 1952.

Eight proved cases of papilloma of the gallbladder occurring in 425,000 new patients and 2,000 cholecystectomies at the Cleveland Clinic are presented. In 3 patients the diagnosis was made preoperatively by cholecystography, in 1 patient a small papilloma of the gallbladder was palpated at the time of gastric resection, and in 4 the papilloma was an incidental finding by the pathologist. There were associated gallstones in 3 patients, cholesterosis in 1, chronic cholecystitis in 2. Only 2 patients had no apparent associated cholecystic disease. In no instance could symptoms be attributed to the papillomas.

The only way to make a correct clinical diagnosis of papilloma of the gallbladder is by cholecystography, although a few cases have been reported in which the tumor was large enough to be palpated through the abdominal wall. The use of routine postero-anterior and decubitus views is most helpful in the diagnosis. If a small round defect suggesting a papilloma is seen, it is usually wise to repeat the examination to determine whether the defect is present in the same position on another occasion. The authors were unable to demonstrate roentgenologically papillomas smaller than 4 mm. in diameter.

Three roentgenograms; 1 photograph.

Fibrotic Stenosis of the Terminal Common Duct. Philip F. Partington. Surgery **31**: 367–372, March 1952.

The author presents a group of 3 patients with marked symptoms of biliary tract disease in spite of normal filling and emptying of gallbladders which did not contain calculi at the time of standard cholecystography. All 3 patients had histories, of several years duration, of epigastric and sharp right upper quadrant pain which occasionally radiated to the back and was associated with nausea and vomiting. In 2 of the patients typical attacks of pain could be produced by injections of morphine. As a result of the unexplained nature of their symptoms, all 3 patients were considered to be psychoneurotic. None of them had been jaundiced, but weight loss up to a maximum of 45 pounds was a prominent symptom in 2 cases.

Oral cholecystography revealed gallbladders which filled, emptied with some delay, and contained no stones. The common ducts were slightly dilated and terminated with abrupt narrowing in the region of the sphincter of Oddi. In 2 cases, various antispasmodics including atropine, amyl nitrite, and nitroglycerine, were administered without affecting this narrowing. All 3 patients were considered to have partial obstruction of the terminal common duct in the region of the sphincter of Oddi.

On operation, the gallbladder appeared normal in 2 cases and somewhat thickened in the third. In all 3, operative cholangiography confirmed the preoperative diagnosis of partial obstruction of the terminal common duct. The gallbladder was removed in each instance. Microscopic examination in the first case revealed cholesterosis. Transduodenal exploration of the sphincter showed it to be a firm cylinder of tissue measuring roughly 2.0 × 0.5 cm., with a lumen which would not admit a probe. In each of the other cases there was duodenal scarring suggestive of inactive duodenal

ulcers. In 1 case it was impossible to pass a No. 10 French catheter into the duodenum; in the other, only the tip of a bougie passed through the sphincter. Biopsy showed increased fibrous connective tissue in the sphincter muscle with considerable increase in over-all thickness. Both gallbladders were normal on microscopic examination.

All 3 patients were relieved of their attacks of severe right upper quadrant pain. Only 1 was asymptomatic, however, at the time of the report, and the follow-up period was short.

Six roentgenograms; 1 drawing.

Oil Granuloma of the Peritoneum. H. Stanley Bennett and E. N. Collins. Gastroenterology **20:** 485–491, March 1952.

Two cases are presented which demonstrate the late effects of the instillation of liquid petrolatum into the peritoneal cavity. Though the practice of using this substance for the alleged prevention of adhesions no longer exists, it apparently was widespread at one time and the recognition of the possible late effects is important. Probably the commonest symptoms are those of intestinal obstruction, either partial or complete. Large, hard, nodular abdominal masses were prominent findings in the authors' cases. Such masses might easily be confused with carcinomatosis.

The diagnosis can be made presumptively before surgery by the appearance of annular and plaque-like calcifications in any roentgenogram of the abdomen, whether it be a scout film or part of an examination of the urinary tract or bowel. A history of one or more abdominal operations and possibly, on direct questioning, of the previous use of oil instillations offers further evidence. The fact that in this condition multiple, widespread, annular calcifications are seen excludes from serious consideration the commoner causes of abdominal calcification, with the possible exception of pseudomyxoma peritonei.

Two roentgenograms; 1 photomicrograph.

RICHARD A. ELMER, M.D.
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THE MUSCULOSKELETAL SYSTEM

Gargoylism (Dysostosis Multiplex): Two Adult Cases with One Autopsy. Edward B. Smith, Theodore C. Hempelmann, Sherwood Moore, and David P. Barr. Ann. Int. Med. **36:** 652–667, February 1952.

Gargoylism is a heritable and congenital condition, attributable at least in part to defects in cartilaginous development which lead to dwarfism and to characteristic deformities of the skeleton. Some confusion exists in both designation and description. Cases have been recorded under such titles as scaphocephaly, acrocephaly, chondrodystrophy with infantile myxedema, and Morquio's disease.

Certain clinical features tend to be more or less constant. Among these are dwarfism, a marked shortening of the trunk and neck, an enlarged and misshapen skull, low-placed ears, prominent forehead, protuberant temporal bones, and short nose with depressed bridge and broad base. In several cases a marked elongation and anterior "pocketing" of the sella turcica have been observed in roentgenograms of the skull. The hands are large, with limitation of the extension of the fingers. Supination and pronation are also greatly limited. Talipes equinus has been common. In all cases the abdomen has been prominent, with a pouting, low-hung umbilicus and, not infrequently, umbilical hernia. Kyphosis of the lower dorsal and lumbar vertebrae or of the lumbar region alone has often been noted. Haziness or cloudiness of the cornea is present in about 75 per cent of cases. Deafness, sometimes almost complete, is frequent. Mental deficiency has been much emphasized but is an inconstant feature. Peculiar granules in the neutrophilic leukocytes have been observed.

Nearly all recorded cases of this disease have been in infants and children. The two cases reported here are of special interest in that the patients were adults: a twenty-eight-year-old man, who came to autopsy after twenty-two years observation, and a man still living at the time of the report and reasonably well at the age of twenty-nine.

In Case I, the earliest x-ray films, taken when the patient was five and one-half years of age, showed both lambdoid and sagittal sutures to be closed, while the coronal suture was open and prominent. The anterior fontanel was not closed. The sella turcica was elongated. The temporal bones were unusually prominent and bulged out from a somewhat narrow vertex. The frontal region and the diploic veins were prominent. Later roentgenograms of the skull, taken at the age of nine and one-half and nineteen years, revealed gradual closure of the coronal suture, tremendous diploic blood vascular spaces in the frontal bone, and arterial grooves throughout the remainder of the calvarium. The pituitary fossa showed a progressive enlargement and elongation in the anteroposterior diameter, with some increase in depth. No erosion or destruction of the dorsum sellae was evident. Films of the hands, taken at the age of ten, showed little evidence of delay in ossification of the bones of the carpus; the metacarpal bones were thickened, widened, bowed, and of irregular contour. Even at the age of nineteen the epiphyses were not united. The line of ossification was irregular in the diaphysoepiphyseal junctions, this feature being particularly evident at the lower ends of the radius and ulna. There was irregularity of the articular aspects of all of the epiphyses.

A bilateral bowing indicating an increase in the length of the radius was noted. The hip joints visualized at the age of five and one-half years showed no striking abnormality. The ankle joint at nineteen years showed epiphyseal cartilages still present, but no evidence of bone change comparable to that in the forearm was demonstrable.

The curious deformity of the sella turcica seen in this patient has been observed in all cases of gargoylism and is virtually diagnostic of the condition. It seems likely that it is an integral part of the general dysostosis of the skull.

The authors' second case is unusual for the long duration of life, lack of corneal opacity and auditory defects, and absence of mental retardation. Otherwise, the patient presents the classical clinical, roentgenologic and pathologic (liver biopsy) features of gargoylism. Chemical analysis of the biopsy specimen and the blood showed no increase in lipids, refuting the argument that a lipid or "lipid-like" substance is concerned in the disease.

Four roentgenograms; 4 photographs.

STEPHEN N. TAGER, M.D.
Evansville, Ind.

Engelmann's Disease (Progressive Diaphyseal Dysplasia). Leroy S. Lavine and Morris T. Koven. J. Pediat. **40**: 235–239, February 1952.

Engelmann's disease, a syndrome characterized by fusiform expansion and hyperostosis of the diaphyses of the long bones together with wasting and anomalous muscular signs, is either extremely rare or seldom recognized, only 11 cases having been reported since Engelmann first called attention to the condition in 1929. The authors present an additional case, in a twelve-year-old boy, whose chief complaints were muscular weakness and poor appetite. Physical examination showed him to be slender and malnourished. The upper and lower extremities were long in proportion to a narrow torso. There were no spinal or chest deformities. Through a sparse musculature, one could palpate non-tender symmetrical areas of bone thickening in the shafts of the femurs and tibias. Roentgenography revealed progressive, symmetrical endosteal and periosteal new-bone formation in the diaphyses of the long bones. The epiphyses and metaphyses appeared normal. The involved areas showed a dense, thickened cortex encroaching upon the marrow cavity. Microscopically, the lesion was solid osteopetrosis.

The etiology and pathogenesis of Engelmann's disease are unknown. The authors believe that the work of Thiersch (Radiology **51**: 100, 1948), who obtained similar bone lesions in chicks by intravenous injection of human myeloid leukemic material, may be of considerable importance in the further investigation of all bone diseases characterized by osteopetrosis.

Three roentgenograms; 1 photomicrograph; 1 photograph.

Peripheral Bone Metastasis from Carcinoma of the Rectum. Review of the Literature and Report of an Unusual Case. Charles A. Beskin and Warren G. Atwood. Surgery **31**: 273–277, February 1952.

Metastasis to bone from carcinoma of the rectum is rare, the reported incidence ranging from 0.5 to 10.5 per cent. It occurs most commonly in the vertebrae, pelvis, and ribs. Peripheral bone metastasis is a distinct rarity and is almost always associated with generalized visceral and skeletal spread.

The authors report a case of proved solitary metastasis to the left fourth metatarsus in a patient clinically well six months after abdominoperineal resection for carcinoma of the rectum.

One roentgenogram; 2 photomicrographs; 1 table.

Joint and Skeletal Muscle Manifestations in Sarcoidosis. Gordon B. Myers, A. M. Gottlieb, P. E. Mattman, G. M. Eckley, and J. L. Chason. Am. J. Med. **12**: 161–169, February 1952.

Four cases of sarcoidosis with the following manifestations in common are presented: (1) migratory febrile polyarthritis resembling rheumatic fever, but refractory to salicylates; (2) hilar lymphadenopathy demonstrated on roentgenograms of the chest; (3) noncaseating epithelioid granulomas of sarcoid type, demonstrated by muscle biopsy in 3 cases and by lymph node biopsy in 1. In addition, erythema nodosum was present in 3 patients, finely nodular pulmonary infiltrations in 2, generalized lymphadenopathy in 2, healed chorioretinitis in 1, and acute uveitis and parotitis in 1 patient.

Migratory polyarthritis manifested by fever, pain, swelling, and usually rubor and calor, resembling rheumatic fever, was observed in all 4 cases. The arthritis was refractory to salicylates but gradually subsided to leave few or no residual deformities. These joint changes were not accompanied by roentgenologic evidence of osseous sarcoidosis.

The results of this study suggest that random muscle biopsy may constitute a valuable adjunct for the establishment of the diagnosis of sarcoidosis, particularly in patients without cutaneous lesions or significant, lymphadenopathy.

Three roentgenograms; 5 photomicrographs.

HOWARD L. STEINBACH, M.D.
University of California

Hepatogenous Osteoporosis. Umberto Cocchi. Radiol. clin. **20**: 362–382, November 1951. (In German)

This report on osteoporosis associated with chronic diseases of the liver and biliary system is based upon 51 cases collected from the literature, 11 animal experiments, and 27 examples seen by the author, making a total of 89 cases. Osteoporosis was encountered in Laennec's cirrhosis, pigmentary cirrhosis, and acute yellow atrophy either with or without jaundice; it was also seen in obstructive jaundice and in association with external bile fistulae, but it is never observed in cases of liver metastases without obstruction.

The osteoporotic changes are of four types, which can be diagnosed only histologically: (1) osteoclastic osteoporosis (increase of physiological bone absorption); (2) osteoblastic osteoporosis (decrease in physiological bone deposition); (3) a combination of osteoclastic and osteoblastic osteoporosis; (4) osteoid osteoporosis (newly formed osteoid tissue remaining uncalcified for a long period of time).

The roentgen examination reveals in all cases a diffuse osteoporosis, mainly of the lower dorsal and lumbar spine, more infrequently of the pelvis, the ribs, and the extremities. The vertebral bodies are wedge-shaped and show indentations of the upper and lower plates. Rarely spontaneous fractures occur. It is noted that a minimum of 30 per cent atrophy of the bony structures of vertebral bodies is required before a roentgen diagnosis of osteoporosis can be made.

The osteoporotic changes are probably caused by deficient absorption of fats and calcium due to damage to the liver and interference with the flow of bile, D-hypovitaminosis, hormonal changes in the parathyroids, adrenals, reproductive glands, and hypophysis.

Four roentgenograms; 5 tables.

EUGENE F. LUTTERBECK, M.D.
Chicago, Ill.

Syndrome of Joint and Cartilaginous Pathologic Changes with Destructive Iridocyclitis: Comparison with Described Concurrent Ear and Joint Diseases. A. C. Hilding. Arch. Int. Med. **89**: 445–453, March 1952.

All ophthalmologists of experience have seen rheumatoid arthritis associated with destructive iridocyclitis and perhaps blindness. The patients ordinarily show severe ankylosis in many joints and frequently are more or less helpless because they are frozen in one position. A number of other joint diseases, *e.g.*, Still's disease, Reiter's syndrome, Behçet's syndrome, Stevens-Johnson syndrome, are associated with iridocyclitis.

The patient who is the subject of the present report, however, presented a concurrent iridocyclitis, atrophy or deformity of body cartilages, and multiple joint dislocations, without any destruction of either bone or joint surface. No similar case has been recorded in the literature. While the condition seems to be related to rheumatoid arthritis, there was no ankylosis of the joints and little damage to the joint surfaces was demonstrable roentgenographically. On the other hand, the joint capsules seemed exceedingly lax. The involvement of body cartilages, other than in the joints, including those of the ears and nose, was widespread. Roentgenograms of the hands are reproduced to show the extreme laxness of capsular ligaments and the multiple dislocations. At the time of the report the patient was bedridden because of dislocations and entirely blind following iridocyclitis, extreme hypotony, and degenerative changes of the intraocular structures.

Three roentgenograms; 4 photographs; 2 tables.

Ameliorative Effect of Antibiotics on Nonlipoid Reticuloendotheliosis (Letterer-Siwe Disease) in Identical Twins. Howard R. Bierman, Jonathan T. Lanman, Kenneth S. Dod, Keith H. Kelly, Earl R. Miller, and Michael B. Shimkin. J. Pediat. **40**: 269–284, March 1952.

This is a report of non-lipoid reticuloendotheliosis (Letterer-Siwe disease) in identical twins. The illness was noted in both children at the age of six months. It was of acute onset, with an upper respiratory infection followed by lymphadenopathy, anemia, and multiple destructive lesions of the skeleton. Each child was treated separately with a combination of Aureomycin, Chloromycetin, Streptomycin, and Penicillin, with the other twin being observed as a control in order to evaluate objectively the effectiveness of these antibiotics. In both twins the administration of the antibiotics was followed by marked clinical improvement associated with disappearance of hepatosplenomegaly and lymphadenopathy, regression of anemia, and roentgen evidence of healing and disappearance of osteolytic lesions. At the conclusion of the treatment, at the time the report was written, both children appeared well. Despite the encouraging improvement following antibiotic therapy, the roentgenographic findings suggested that the disease process had not completely disappeared.

Twenty-one roentgenograms; 3 photographs; 4 photomicrographs; 2 graphs; 1 table.

HOWARD L. STEINBACH, M. D.
University of California

Coexistence of Polyostotic Fibrous Dysplasia and Juvenile Tabes. A. C. Bingold. Brit. J. Surg. **39**: 472–474, March 1952.

The author reports the case of a 15-year-old girl who sustained a pathological fracture of the neck of the left femur. Skeletal changes of fibrous dysplasia were found in the right humerus, radius and tibia, and in the left hand, ilium, femur, tibia, and fibula. Treatment was by bone-graft. Microscopic examination confirmed the roentgen diagnosis. The blood and cerebrospinal fluid Wassermann reactions were positive. Pupils reacted to accommodation but not to light, and ankle jerks were absent. The author speculates whether "the fibrodysplastic foci in the patient's skeleton represent burnt-out syphilitic lesions."

The fracture was still firmly united nineteen months after operation, and it was protected by a new trabecular system, but the graft had become largely absorbed. In spite of vigorous antisyphilitic therapy, a neuropathic left subtaloid joint developed.

Eight illustrations, including 6 roentgenograms.

DONALD DEF. BAUER, M.D.
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Osteoid Osteoma in Childhood. Howard M. Purcell, Stephen D. Mills, and Paul. R. Lipscomb. Pediatrics **9**: 295–303, March 1952.

This is an excellent review of 13 cases of osteoid osteoma in children seen at the Mayo Clinic. Osteoid osteoma is a benign tumor of bone, usually of endochondral origin. The gross finding is an area of dense bone within which is a nidus, usually less than 1 cm. in diameter, reddish-brown in color, and friable. Microscopically, the nidus is made up of irregular spicules of osteoid tissue. There may be calcification in the osteoid tissue. Mitotic figures are not increased in number and there are no cells characteristic of inflammation.

The outstanding symptom is pain. There may be swelling if the lesion is superficial. Loss of weight, tenderness, and atrophy may also be present. The roentgenogram characteristically reveals a small area of radiolucency surrounded by osteosclerosis. The zone of rarefaction usually has a fairly well defined margin. Sometimes the roentgenogram must be overexposed to demonstrate the nidus. The variation in the roentgen appearance is such, however, that diagnosis will frequently—and ultimately—depend on the microscopic examination. Laboratory findings are normal.

Among the conditions to be differentiated are Brodie's abscess, solitary cortical abscess of bone, chronic sclerosing osteomyelitis of Garré, tuberculous cavity of bone, Ewing's tumor, and osteogenic sarcoma.

The treatment is complete removal of the nidus.

Seven roentgenograms; 1 photograph.

PAUL W. ROMAN, M.D.
Baltimore, Md.

Accelerated Ossification in a Cretin Caused by High Thyroid Dosage. Thomas Colver and Thomas Lodge. Brit. M. J. **1**: 89–90, Jan. 12, 1952.

Since there is a possibility that high thyroid dosage in cretinism may cause advanced ossification, it is advisable during treatment to take serial roentgenograms of the centers of ossification if maximum dosage is given.

The case of a full-term female infant is reported who at fourteen weeks of age became drowsy, stopped smiling, developed a feeble hoarse cry, and showed an altered facial expression. On examination she was found to be a typical cretin. X-ray examination showed delay in ossification, and no centers were visible for the cuboids, the heads of the tibias, or the wrists.

The infant was given increasing doses of thyroid extract rapidly, to the limits of clinical tolerance. Within nineteen days there was a typical therapeutic response, with dramatic improvement in appearance and symptoms. Roentgenograms of the wrists at fifteen months showed that ossification, initially retarded, was now very advanced. Six carpal centers were present, as well as those for the lower end of the radius and head of the fifth metacarpal. Ossification had therefore reached a degree expected for a female child of four years, three months.

After fifteen months of age the thyroid dose was substantially reduced, but at three years the bone age was still advanced, being equivalent to that of a child of five years, nine months.

A future possibility to be considered is that of premature union of epiphyses with the diaphyses of the growing bone.

The authors refer in an addendum to a recent paper on this subject by Schlesinger and Fisher (Lancet **2:** 289, 1951. Abst. in Radiology **59:** 140, 1952).

One roentgenogram; 2 photographs.

FRANK T. MORAN, M.D.
Auburn, N. Y.

Roentgenologic Examination of the Function of the Lumbar Spine. E. Hasner, M. Schalimtzek, and E. Snorrason. Acta radiol. **37:** 141–149, February 1952.

In general, the usual examination of the lumbar spine with the patient recumbent gives no information concerning its carriage, mobility, and stability. For this reason the authors undertook roentgenographic functional tests in 90 patients, aged eighteen to seventy-two years. Flexion, extension, and lateral bending studies—in the sitting position—were made.

In 45 of the 90 cases the routine roentgen findings and those on functional roentgen examination were in agreement (41 positive; 4 negative); 26 cases which appeared negative on the routine films showed positive findings on functional studies, while 19 cases not submitted to routine roentgenography were also positive functionally. Thus, even with the omission of these last 19 cases, there is a "considerable preponderance in favor of the roentgen functional examination."

In another series of cases the results of routine roentgenography, the functional roentgen examination, and myelography were compared. In a majority of the cases the functional examination yielded more information than myelography.

Six roentgenograms; 5 tables.

JOSEPH P. TOMSULA, M.D.
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Roentgen Examination of the Cervical Spine of Swingers and Wrestlers. C. Buetti. Radiol. clin. **20:** 353–362, November 1951. (In German)

Swiss wrestling, a national pastime, differs little from the American variety and Australian tag. In all three, the cervical spine suffers particular stress because of the frequent assumption of a position in which the body of the participant is arched backward resting on the occiput and pelvis to avoid the touching of the shoulders to the mat.

The author examined 17 individuals ranging from twenty to forty years of age who have been active wrestlers for many years. Six typical case reports are recorded and illustrated. Severe spondylarthrotic changes were observed, as well as narrowing of the disks, herniations of the nucleus pulposus, and calcifications of the anterior ligament, causing various deformities and changes of the normal lordosis of the cervical spine. In spite of rather extensive radiological changes, clinically there were no complaints, and none of the men examined recalled any particular accident. None was incapacitated, though there was some limitation in motion.

The frequency of degenerative changes of the cervical spine in young individuals is emphasized. It is questioned whether one should restrict the participation of young wrestlers in national tournaments and whether it would be possible to reduce the use of the "bridge position" to a minimum in this sport.

The findings discussed here are of interest to medical examiners connected with athletics and should be considered in disability evaluation.

Eight roentgenograms; 1 photograph.

EUGENE F. LUTTERBECK, M.D.
Chicago, Ill.

Radiologic Diagnosis of Spinal Tumors. Seventy Cases. Guido Lombardi. Radiol. med. (Milan) **38:** 193–216, March 1952. (In Italian)

This article is based upon 600 myelographic studies performed at the Neurological Institute at the University of Milan. Seventy spinal tumors thus discovered are recorded with a comparison of the radiological signs and the operative findings. All of the examinations were performed with 5 c.c. of Lipiodol F. This preparation has a low degree of viscosity, behaves like Pantopaque, and can be withdrawn following the examination.

The author describes in detail the findings in extradural tumors (12 cases), intradural medullary tumors (12 cases), and endodural extramedullary tumors (46 cases).

Forty-one excellent roentgenograms and 14 schematic drawings.

CESARE GIANTURCO, M.D.
Urbana, Ill.

X-Ray Visualization of the Intervertebral Disk, with a Consideration of the Morbidity of Disk Puncture. W. James Gardner, Robert E. Wise, C. Robert Hughes, F. B. O'Connell, Jr., and E. C. Weiford. Arch. Surg. **64:** 355–362, March 1952.

The technic of roentgenographic visualization of the intervertebral disks is described and the authors' experience, involving 169 disks, is recounted. A 21-gauge needle 2.5 inches long is inserted into the spinal canal. After removing the stylet, a 26-gauge needle 3.5 inches long is passed through the shorter heavier needle and into the intervertebral disk. The position of the needle is checked roentgenographically and Diodrast (35 per cent) is injected (0.5 to 2.0 c.c.). Anteroposterior and lateral films are obtained immediately after the injection.

Essentially three types of disks will be outlined: (1) The normal disk usually shows a bilocular collection of dye in its middle third in both projections. Injection of the normal disk is made against great resistance; it is usually painless, and pain radiating down the leg is not produced. (2) The degenerative type of disk without herniation shows a dye shadow which is neither discrete nor bilocular but is spread irregularly, often extending to or even beyond the margins of the vertebral bodies. The injection of this type of disk is also made against considerable resistance and is usually painless. (3) The symptomatic type (degenerative disk with posterior protrusion) shows in addition to the irregular appearance in the disk space, the presence of dye beneath the posterior spinal ligament, which bulges into the spinal canal. In these cases, injection encounters less resistance and a sciatic pain may be reproduced. In this study 186 injections were undertaken in 89 patients and 169 satisfactory "diskograms" were obtained. In approximately one-third of cases of surgically proved

disk protrusions, some of the injected dye was visible in the epidural space in the roentgenograms. It is emphasized, however, that this finding is not pathognomonic of a tear of the posterior spinal ligament and is significant only when accompanied by roentgen evidence of protrusion.

Certain disadvantages of "diskography" are recognized and discussed. It is pointed out that the procedure should never be performed without previous examination of the spinal fluid, thus helping to eliminate the presence of a cord tumor.

Morbidity may occur as the result of this procedure. In one of the authors' cases septic necrosis of the disk developed. With this exception, the gross and microscopic appearance of the disk material removed from a few hours to three weeks after injection was found to be no different from that removed in similar cases in which diskography was not performed.

Five roentgenograms; 1 drawing.

RICHARD A. ELMER, M.D.
Atlanta, Ga.

Manipulation of the Herniated Intervertebral Disc. James N. Wilson and Frederic W. Ilfeld. Am. J. Surg. **83**: 173–175, February 1952.

Eighteen patients with symptoms of intervertebral disk herniation were studied by fluoroscopy with intraspinal Pantopaque before and after rotary manipulation to determine if manipulation altered the position of the herniated disk. The clinical signs and symptoms consisted of back pain with radiation down the posterior aspect of one or both legs, decreased ankle jerk, positive Lasègue's sign, atrophy of the thigh or calf, sciatic notch tenderness, and muscular weakness and hypesthesia in the peripheral nerve distribution of the lower lumbar and sacral nerves. The findings on routine x-ray examination were non-specific in nature, but in some instances there was a decrease of the interspace at L-4 or L-5 with minimal lipping of the vertebral bodies. Myelographic examination showed defects which were interpreted as due to herniation in 13 cases.

Immediately following the initial visualization of the Pantopaque column by fluoroscopy, and with the medium still in place, manipulation of the rotary type was carried out with the patient on the x-ray table. In 12 patients no change in the x-ray appearance of the defect was observed following manipulation. In 1 patient there was a slight increase in the size of the defect. Three patients experienced temporary relief of the back and leg pain for a period of forty-eight hours. None of the others noticed any change in symptoms. Twelve patients subsequently underwent exploratory laminectomy, and in 11 cases the x-ray findings were confirmed and a protruded or extruded disk was removed at one or more levels.

Four roentgenograms; 1 photograph.

Solitary Myeloma of Rib Simulating Mediastinal Tumor. Report of a Case. Frederick T. Merchant. Surgery **31**: 285–290, February 1952.

A case is reported which is believed to represent a true example of solitary myeloma of the rib. A 64-year-old woman was admitted to the hospital complaining only of dyspnea and orthopnea of three weeks duration. Physical examination showed a marked shift of the mediastinum and heart to the left, with flatness to percussion over the entire right chest and absence of breath sounds. On thoracentesis, 3,500 c.c. of slightly blood-tinged amber fluid was obtained, which showed no evidence of infection or tumor cells. The remaining fluid level, however, still obscured the right lung field on x-ray examination, and repeated efforts to aspirate completely the right pleural cavity were without success. After ten days, trocar and catheter drainage was established and the pleural cavity was drained in stages. Roentgenography then revealed a large mass in the lower pleural cavity, interpreted by the roentgenologist as a large pulmonary cyst. Bronchography showed the mass to be extrapulmonary. It appeared to arise from the mediastinum and could not be projected away from the area on the chest wall during fluoroscopic examination or in oblique views. The rib structure beneath the tumor could not be made out on the roentgenograms. The preoperative diagnosis was anterior mediastinal tumor, probably dermoid, with intrapleural projection.

On thoracotomy, a large, 12 × 8-cm., dull red, friable, encapsulated mass was found arising from the anterior portion of the thorax in the region of the fourth and fifth ribs. The entire tumor, together with the fifth rib from which the growth arose, was resected. Except for a slight hydrothorax, which was relieved by two thoracenteses, the postoperative course was uneventful. The pathologist's diagnosis was multiple myeloma with typical amyloid deposits. After x-ray studies of the skeleton which failed to reveal any other evidence of disease and a negative sternal biopsy, the diagnosis was changed to solitary myeloma of the rib.

Following discharge from the hospital, the patient was given a full course of deep x-ray therapy to the right chest region (details not given). Repeated x-ray examinations of the skeleton revealed no evidence of other lesions, and two sternal biopsies showed only mild hyperplasia. Sixteen months after the operation the patient was readmitted to the hospital with abdominal swelling. Abdominal paracentesis produced 6,000 c.c. of slightly cloudy amber fluid, in which no tumor cells could be found. Further x-ray therapy was administered. Fluid again accumulated in the abdomen. The chest remained clear, and examination of the bony structure was normal. The patient died about eighteen months postoperatively. Permission for autopsy was refused.

Two roentgenograms; 2 photomicrographs.

Cough Fracture. J. B. Mitchell. Brit. M. J. **2**: 1492–1493, Dec. 22, 1951.

Of 720 new adult non-tuberculous patients examined during 1950 at the Cambridge Chest Clinic, 14 had cough fractures. These fractures were sought especially among patients with pleural pain for which no other cause was apparent. In all cases of cough fracture coughing occurred before the onset of pain. Coughing was vigorous in all but one instance, in which the patient tried hard to suppress it. An oblique radiograph was taken in addition to the standard anterior view, and in doubtful cases the examination was repeated after callus had had time to form. Out of 64 such patients, 14 (21.9 per cent) had fractured ribs.

Emphasis is placed on the differential diagnosis between pleurisy and fractured rib.

Two roentgenograms; 2 tables.

HARRY HAUSER, M.D.
Cleveland City Hospital

Cough Fracture of the Ribs Unassociated with Pulmonary Tuberculosis. N. Wynn-Williams. Brit. M. J. **2**: 1494–1496, Dec. 22, 1951.

Fractures of the ribs may be produced by frank trauma or may follow local or generalized abnormalities of the bones which reduce their ability to withstand the strain of normal muscular movement. A further type has been described and variously referred to as "stress," "cough," or "fatigue fracture."

Cough fracture most commonly affects the sixth to the eleventh ribs and is commoner in women. The author reviews the pertinent literature on the subject and reports briefly 9 cases coming under his observation, unassociated with pulmonary tuberculosis or abnormality of the ribs. These were found among 2,431 new patients referred for an opinion on the chest between March 1949 and October 1950. Such an incidence (0.37 per cent) is not unusual. Six of the patients were women and 3 were men; the youngest was aged twenty-two and the oldest seventy-three. The postero-anterior projection was usually diagnostic, but a second radiograph after callus had formed was necessary in 4 cases to establish the diagnosis.

HARRY HAUSER, M.D.
Cleveland City Hospital

Adolescent Coxa Vara: Clinical Considerations and Aspects of Treatment. Ira H. Rapp. South M. J. **45**: 177–182, March 1952.

Adolescent coxa vara or slipping of the upper femoral epiphysis must be recognized early if a good therapeutic result is to be achieved. In the later stages the outcome is equivocal even in the best of hands. The plan of treatment for the various stages of adolescent coxa vara used by the author over the past ten years is presented.

A roentgenogram properly taken establishes the diagnosis even in the early case. An anteroposterior view is not sufficient, however. It must be supplemented by a lateral film, which will reveal the extent of displacement.

Adolescent coxa vara may be divided into the following types or stages: (1) acute; (2) chronic or gradual, including (*a*) separation of less than 1.0 cm. and (*b*) separation of more than 1.0 cm.; (3) residual, including (*a*) malunion and (*b*) traumatic arthritis. No one form of treatment will suffice for all stages, and each case in its respective stage must be individually evaluated from a clinical and radiologic point of view.

In the acute type, manipulation may be quite satisfactory. Chronic separation, with less than 1.0 cm. displacement, can be treated successfully by pinning *in situ* with a Smith-Petersen nail. With more than 1.0 cm. displacement, arthrotomy with replacement of the head on the neck under direct vision is the procedure of choice; the head and neck are then transfixed by a Smith-Petersen nail. Treatment of the late stages is reviewed briefly to emphasize the importance of early recognition of the condition.

Twelve roentgenograms. JOHN M. KOHL, M.D.
Jefferson Medical College

Pneumoarthrography of the Knee. Theodore E. Keats, Dumont S. Staatz, and Robert W. Bailey. Surg., Gynec. & Obst. **94**: 361–364, March 1952.

This report covers a series of 200 pneumoarthrograms obtained at the University of Michigan Hospital. Eighty of the patients were subjected to arthrotomy.

A comparison was made of the accuracy of diagnosis of internal derangements of the knee by (1) clinical diagnosis, (2) pneumoarthrography, (3) combined clinical and pneumoarthrographic evidence. The number of clinical diagnoses found on operation to be accurate as to type of abnormality and its location was 56 (70 per cent). A correct pneumoarthrographic diagnosis, without benefit of clinical information, was made in 60 cases (75 per cent). A correct diagnosis with the contributions of both clinical and pneumoarthrographic evidence was made in 72 cases (90 per cent).

Experience in reading pneumoarthrograms increases the accuracy of diagnosis significantly. There were no complications resulting from the procedure in the authors' series.

Nineteen roentgenograms.

HOWARD L. STEINBACH, M.D.
University of California

Mechanism, Reduction Technique, and Results in Fractures of the Os Calcis. Peter Essex-Lopresti. Brit. J. Surg. **39**: 395–419, March 1952.

In fracture of the calcaneus, two types of dislocation occur. In the first, the tongue type, the secondary fracture line runs straight back to the posterior border of the tuberosity. In the second, the joint depression type, it runs across the body just behind the joint. Each type of fracture can be reduced by simple methods. Sixty per cent of all cases are best treated by exercises alone, with no attempt at reduction. In the remaining 40 per cent of cases, if union is allowed to occur in deformity, the patient is left with permanent disability. Two technics are described for proper reduction. With these, normal mobility in a pain-free foot can be expected, with a return to full work in less than six months. Exact reposition of the fragment is essential.

Special attention is given to the roentgen appearance of the normal calcaneus in various projections, and the changes in the x-ray picture as the os calcis moves through its complicated normal range of movement on inversion and eversion. In the lateral view, as the foot inverts, the sustentaculum comes into view above the outer cortical buttress and blocks the clear shadow of the posterior subtaloid joint. In eversion the reverse is true—the sustentaculum moves downward below the horizon of the buttress. In each instance the outline of the saddle-shaped posterior subtaloid joint changes a little, but its crucial outer half will always be that portion which fits the concavity of the well focused joint surface of the talus passing down to the sharp spur. It should particularly be noticed how the taloid spur descends into the crucial angle at the limit of eversion.

The mechanism of injury with regard to x-ray interpretation is also discussed. Careful study of the roentgenograms enables one to distinguish the two patterns mentioned above.

Tongue Fracture: In the axial view the fissuring in the early stage may not show, but when deformity is extreme, the step between the inner and outer components of the subtaloid joint is readily visible. The main features of the axial view, however, are the ballooning and comminution of the lateral wall, with the depressed fragment lying inside, and the fracture of the sustentaculum tali along which the medial part of the bone has been driven downward and inward. In addition, there will be foreshortening. Such cases with secondary upward displacement of the tuberosity form most of the severely comminuted fractures in this type.

Joint Depression Fracture: There is very little variation in pattern from the tongue type, but the distinction makes a great difference in the treatment. The secondary fracture line, as stated above, runs across the body just behind the joint, so that, in the subsequent displacement, the fragment involved consists of a well defined, unbroken piece of bone carrying the articular cartilage of the outer half to two-thirds of the posterior subtaloid joint. This type is more common than the tongue fracture.

Twenty-six figures, including 45 roentgenograms; 6 tables.

DONALD DEF. BAUER, M.D.
Coos Bay, Ore.

Plaster Plombage to Fill Missing Bone Structure. O. Häuptli. Schweiz. med. Wchnschr. **82**: 161–168, Feb. 16, 1952. (In German)

The author treated, in 1947, giant-cell tumors, cystic bone lesions (osteopathia fibrosa cystica localisata) without giant cells, enchondroma, radicular cyst of the jaw, and adamantinoma, with plaster of paris plombage. The treatment included opening of the cyst, curettage, filling with plaster, and roentgen examination. Films made forty to fifty days postoperatively showed a complete absorption of the plaster and its substitution by newly formed bone. Seventeen cases are described and illustrated with roentgenograms.

The author states that plaster is not only useful for its supportive properties, but that it has a specific effect on the bone, stimulating regeneration and the formation of new bone. New bone formation was found to be more rapid with plaster plombage than in analogous cases without it.

Eight cystic bone lesions were treated, with a very good result in 7 and some improvement in the other. In 5 cases of pseudarthrosis results were good in 2, poor in 2, and questionable in 1. In a case of osteomalacia of the carpal bones the result was excellent. In cases of osteomalacia with pseudarthrosis, wire fixation is necessary in addition to the plombage.

Plaster plombage is contraindicated in inflammatory bone defects, tuberculosis, syphilis, and malignant tumors.

The plaster plombage is made from sterilized plaster of paris suspended in penicillin solution. The consistency of the mixture depends on the individual case. A thin solution is easier to instill but can easily be washed away by blood; it is hard to force a thick preparation into the minute cracks. The plaster is usually introduced by a syringe.

Twenty-six roentgenograms.

ILONA D. SCOTT, M.D.
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GYNECOLOGY AND OBSTETRICS

The X-Ray Diagnosis of Genital Tuberculosis. Samuel Rozin. J. Obst. & Gynaec. Brit. Emp. **59**: 59–63, February 1952.

From 2,500 hysterosalpingograms the films were selected of patients in whom a diagnosis of genital tuberculosis was made by histologic examination of the uterine mucosa, inoculation of mucosal material into guinea-pigs, culture of tubercle bacilli from menstrual blood, or cervical and vaginal smears. The author classifies the x-ray findings from the diagnostic point of view in the following categories: (*a*) probable, (*b*) very probable, (*c*) reliable.

(*a*) *Probable signs* of genital tuberculosis are tubal occlusion in the interstitial or mid-portion of the tubes, which are very constricted and devoid of peristalsis, or tubal niches at the abdominal end, resembling fistulas.

(*b*) *Very probable signs* are a shrivelled, deformed uterus in which the corpus is approximately one-fourth to one-fifth the length of the cervix, a tendency to lymphatic penetration of Lipiodol and to tight closure of the tubes. The tubes are devoid of peristalsis or are sacculated, or cast non-homogeneous shadows resembling cotton plugs at their abdominal end, or exhibit filling defects in the tubal lumen. Two or more of such signs may be considered the equivalent of a reliable sign.

(*c*) *Reliable signs* are calcification of lymph nodes in the small pelvis, calcification and stone formation in the tubal lumen and calcification of one or both ovaries.

Eight roentgenograms.

Roentgenographic Cephalopelvimetry. Fred O. Coe. Am. J. Roentgenol. **67**: 449–456, March 1952.

Cephalopelvimetry is a valuable adjunct to the diagnostic procedures used by the obstetrician, and it is the duty of the radiologist to supply him with the most adequate examination possible. An anteroposterior and a lateral film of the pelvis are not sufficient. The method described here is based on four films, as follows: (1) anteroposterior, standing; (2) lateral, standing; (3) inlet; (4) outlet.

The anteroposterior film is made with the patient standing and the film so positioned that the ischial tuberosities are at the bottom. The lateral film is made with the patient standing in the true lateral position so that symmetrical structures will be superimposed. After the first lateral exposure is made, a lead grid with centimeter perforations is suspended in the exact sagittal position as determined by previous measurements with a caliper, and the film is re-exposed, superimposing the grid markings with comparable distortion to that of the bony structures depicted. The inlet film is made in Thoms' position, with the patient sitting so that the inlet is parallel to the table top. Again the grid is suspended at the level of the inlet, and a second exposure is made. The outlet film is made with the patient sitting on the film with the torso flexed to bring the symphysis pubis as near to the film as possible. All films are made with the Potter-Bucky grid except the outlet film, which is made with a Lysholm grid.

With the technic described, one can determine the size, position, maturity, and any abnormalities of structure of the fetus. Dimensions measured either directly or indirectly from the films are: (1) true conjugate; (2) anteroposterior diameter of the mid-pelvis; (3) posterior sagittal diameter; (4) distance of the ischial spines from the superior strait; (5) diameters of the skull which are in profile; (6) transverse diameter of the inlet; (7) oblique diameters of the inlet; (8) interspinous diameter of the mid-pelvis; (9) intertuberous distance; (10) anterior sagittal diameter of the outlet. In addition the following data are observed: (1) position and nature of the presenting part; (2) relation of the head, if presenting, to the symphysis pubis and the promontory of the sacrum; (3) curvature of the inner surface of the sacrum; (4) shape of the pubic arch.

A chart of a scale which is used to compute true measurements from those which are taken directly from

the film is pictured and described. The form used in reporting the data to the obstetrician is also reproduced.

Twelve illustrations, including 6 roentgenograms.

JOHN R. OLSON, M.D.
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THE GENITOURINARY SYSTEM

Abdominal Aortography in Urology. N. E. Berry, E. P. White, and J. O. Metcalfe. Canad. M. A. J. **66:** 215–217, March 1952.

The authors review briefly the subject of abdominal aortography as an aid in urologic diagnosis. They have used the procedure in 52 cases. They do not report on these in any detail, though they state that they feel that the examination can safely be offered to any patient, and that it has been worth the effort expended to develop a reasonable degree of proficiency. They find Urokon the most satisfactory medium.

Eight roentgenograms.

JOHN M. KOHL, M.D.
Jefferson Medical College

Use of Carbonated Beverage as an Aid in Pediatric Excretory Urography. Owen C. Berg and David H. Allen. J. Urol. **67:** 393–396, March 1952.

In 1950, Matthei (J. Urol. **64:** 417, 1950. Abst. in Radiology **57:** 145, 1951) outlined a procedure for obtaining diagnostic urograms, which the present authors have employed in children with good results. The patient is dehydrated for twelve hours except where this is specifically contraindicated. A scout film is taken, after which the contrast medium (Diodrast) is injected intramuscularly or intravenously. Immediately thereafter, an 8-ounce bottle of the usual formula is offered the infant, or in the case of the small child one or more 8-ounce glasses of plain or chocolate milk. The ingested material distends the stomach, which in turn displaces the colon and small bowel, leaving an unobstructed and undistorted view of the kidney structures through the gastric shadow. The administration of the milk at the beginning of the examination does not cause sufficient dilution of the medium to interfere with the visualization.

It occurred to Berg and Allen that even better urograms might be obtained with the use of some substance less dense than milk, since milk approximates unit tissue density and therefore cuts down soft-tissue detail. With this in mind, they began substituting Coca-Cola for milk. In older children this has worked very well. The primary difficulty in younger children has been "burping," with the consequent escape of the necessary gaseous medium. It is now the routine to dehydrate all infants and small children. The anteroposterior scout film is followed by the administration of 10 or 20 c.c. of 50 per cent Neo-iopax. Six to 12 ounces of Coca-Cola are then given during the next five minutes. Roentgenograms are made at five, ten, fifteen, and thirty minutes. Older children are advised not to eructate. Matthei's technic is followed in children under sixteen or eighteen months of age except that Neo-iopax is used as the contrast medium.

The use of a carbonated beverage instead of milk has greatly improved the soft-tissue details of the kidneys and upper psoas shadows. In some instances, the use of Coca-Cola has provided pelvic and calyceal outlines comparable in quality to retrograde pyelograms.

Seven roentgenograms.

Use of Helium in Perirenal Insufflation: Preliminary Reports. Bernard Levine. J. Urol. **67:** 390–392, March 1952.

Since the diffusion rate of helium is almost three times that of oxygen or nitrogen, it is suggested that this gas be used instead of oxygen or air in perirenal insufflation. Perirenal helium insufflation was performed by the author in 8 cases, without ill effects and with excellent roentgenographic results. A pneumothorax apparatus was employed, and about 500 c.c. of gas was instilled on each side. Bilateral insufflations are done at one sitting. The usual precautions are taken to avoid introduction of helium into the blood stream.

Five roentgenograms.

Studies in Pyelorenal Backflow. James A. Ross. Brit. J. Urol. **24:** 27–38, March 1952.

In a review of 1,876 urological reports from the Diagnostic Theatre, Edinburgh Royal Infirmary, over a three-year period, 38 cases showing some degree of pyelorenal backflow were found. Examples of the following varieties of backflow are presented: pyelointerstitial or pyelosinus transflow; pyelovenous; pyelotubular or pyelocanalicular; pyelolymphatic or sinolymphatic.

The author's investigation did not conclusively determine what exactly produces the appearance of fine lines and streaks passing medially from the kidney in certain retrograde pyelograms. These may be due to pyelolymphatic backflow, the dye extravasated into the renal sinus and interstitial tissues having been rapidly absorbed by the lymphatics; some of the wider channels may represent pyelovenous backflow.

Experiments were carried out on the kidneys of cadavers in an attempt to explain the appearances seen on the retrograde pyelograms. Hinman's observation that it is as easy to inject the veins *via* the ureter as *via* the main renal vein was confirmed, and good examples of pyelovenous backflow were obtained, in readily demonstrable form, as neoprene cysts. Casts and histologic evidence of lymphatic channels have not yet been secured, and further research is required. It seems likely, as Narath pointed out (J. Urol. **43:** 145, 1940), that the usual sequence is pyelointerstitial extravasation with a combination of pyelovenous and pyelolymphatic backflow, both of which produce the appearances seen on roentgenograms.

A manometer has been devised to give some indication of the pressure developed in the renal tract when a retrograde pyelographic examination is performed by injecting the solution from a record syringe by hand. With this it was found that pyelorenal backflow occurs at a variable pressure, the lowest recorded being 25 mm. Hg; it would seem wise, therefore, not to go above 30 Hg.

Fifteen figures, with 10 roentgenograms.

Ectopic Openings of the Ureter. Thomas Moore. Brit. J. Urol. **24:** 3–18, March 1952.

The author describes the various anatomical types of ectopic ureter and presents 8 illustrative cases.

Intravesical Ectopia: Except for trigonal asymmetry, faulty insertion of a normal ureter in the bladder is rare. A supernumerary ureter on one or both sides is not uncommon. The latter condition is best demonstrated by cystoscopy and retrocatheterization, which allows both the collection of urine from the affected

part of the kidney and roentgen visualization of its size and shape. When this is not possible, either because the ectopic orifice cannot be found or cannot be catheterized, diagnosis must depend on the more indirect findings on intravenous pyelography. If the supernumerary part of the kidney has sufficient function, then its calyces and perhaps even its ureter may be outlined. At least the lower renal pelvis is seen, and it may be observed that it is too small in proportion to the size of the renal outline. When stones are present in the supernumerary part of the kidney, the function of which is too poor to show on intravenous pyelograms, they may be found within the renal outline but outside the dye-filled lower renal pelvis. The only satisfactory treatment in such cases is partial nephrectomy and ureterectomy.

Extravesical Ectopia: In the male there are no characteristic symptoms of ureteral ectopia, and the condition is not frequently diagnosed. In the female, an ectopic ureter produces urinary incontinence of a very definite type—so-called paradoxical incontinence. These patients usually pass urine with normal control at regular intervals, due to the fact that a ureter or supernumerary ureter on one or both sides terminates outside the bladder. Diagnosis is most certainly made by the direct demonstration of the ectopic orifice and retrograde pyelography, but in some instances a conclusion must be reached by intravenous pyelography.

Sixteen roentgenograms; 7 photographs; 4 drawings.

Intussusception of the Ureter Associated with a Benign Polyp. Harold V. Morley, Edward J. Shumaker, and Lawrence W. Gardner. J. Urol. **67**: 266–271, March 1952.

Ureteral intussusception is rare; only a few references to the condition can be found in the medical literature. A case is reported by the present authors in which an intussusception of the ureter was associated with an unusual fibrous polyp.

The patient was a 19-year-old male, first seen because of the sudden onset of sharp pain in the right costovertebral angle. The pain radiated to the right upper abdominal quadrant and subsequently to the right lower abdomen without extension into the right testis. There was no disturbance of urination. A similar episode of pain, six months earlier, had led to an appendectomy. The pain was characteristic of ureteral colic, but there were no findings that were pathognomonic of tumor alone. Cystoscopic examination revealed a normal bladder. Pyelography showed a non-opaque filling of the dilated ureter. No tumor cells were found in the urine. The preoperative diagnoses were tumor, non-opaque stones, or blood clot filling the right ureter.

At operation, the right kidney and upper ureter appeared entirely normal. Seven centimeters distal to the ureteropelvic junction a large fusiform swelling with an intussusception of the upper portion of the ureter was found. This swelling was approximately 2.5 cm. in diameter and extended beyond the reach of the original incision. Palpation of the swelling suggested either a tumor or stone, with more likelihood of a solid tumor mass. A nephroureterectomy was performed. The final diagnoses were an unusual fibrous polyp of the ureter undergoing extensive hydropic degeneration, resulting in multiple cyst formation; intussusception of the ureter above the tumor; dilatation of the ureter by polyp; hypertrophy of the ureteral wall. The narrow pedicle by which the relatively large benign new growth was attached undoubtedly was the big factor in causing the intussusception of the ureter. By the same token, the intussuscepted ureter made more complete the obstruction and perhaps made a preoperative diagnosis more difficult.

Two pyelograms; 4 photomicrographs; 2 photographs.

Roentgen Diagnosis of the Diseases of the Prostate. Nils P. G. Edling. J. Urol. **67**: 197–207, February 1952.

Urethrocystography comprises the examination of the prostatic urethra and bladder base by means of a contrast medium (Skiodan) both during retrograde injection and during the act of micturition. The junction of the bladder base and prostatic urethra must be visualized in order to evaluate changes in the prostate gland. After the patient has evacuated the bladder, a scout film is obtained. Frontal and oblique views are obtained, both during injection of the medium and during micturition. Local anesthesia of the urethral mucosa precedes the manipulations.

Normally the urethra lies in the sagittal midplane. It is slightly curved with the concavity anteriorly. The outline is smooth and the colliculus is oval, protruding into the lumen. During injection, the lumen is narrow and the colliculus is always seen; with the patient recumbent, the internal urethral orifice lies level with the upper border of the symphysis; the bladder base is smooth. During micturition the prostatic urethra dilates and the lumen is broadened both in the bladder and in the membranous portion; the bladder contracts, is raised, and shows a "drawn-out" apex; the prostate and bladder are at the same time lowered due to relaxation of the pelvic floor. In normal cases there is no spill of medium outside the limits of the urethra and bladder.

The author, basing his findings on studies performed in the Roentgen Diagnostic Department, Karolinska Sjukhuset, Stockholm, describes the roentgen findings with this method in prostatic disease classified as postinflammatory changes, enlargement of the prostate due to prostatitis, hypertrophy, and carcinoma. The roentgen signs of contracture of the bladder neck and the disturbances following surgery are illustrated.

Filling of prostatic ducts and glands or filling of the utricle or ejaculatory ducts usually indicates so-called postinflammatory change, meaning that there is disease of the walls of these structures and open communication with the urethral lumen. In the same fashion dilatation of the prostatic urethra during injection indicates a postinflammatory change. Prostatic calculi have a similar significance and may be present both in tuberculous and pyogenic infections.

In most cases of prostatitis with hypertrophy the prostatic urethra is of normal length and shape. A benign prostatic adenomatous hypertrophy or enlargement due to cancer may displace prostatic calculi downward. Both also tend to alter the outline of the prostatic urethra and base of the bladder. Smooth and symmetrical alterations in outline naturally indicate a benign neoplastic enlargement; in a malignant lesion asymmetry and irregularity are the rule. Cancer of the prostate is not likely to be found early by urethrocystography, however, because of its usual origin in the posterior lobe.

Bienign or malignant tumor may produce a so-

called bladder-neck contracture. A true barrier occurs in prostatitis cases and also in adenoma of the "third lobe" type. The latter usually produces a smooth spherical defect.

Surgical intervention may result in irregularities of the urethral lumen and base of the bladder. An accurate history is necessary for differential diagnosis.

Sixteen roentgenograms.

JOHN F. RIESSER, M.D.
Springfield, Ohio

Cysto-Urethrograms Before Prostatectomy. Alex W. Boone. J. Urol. **67**: 358–363, March 1952.

The author presents a further refinement in the technic of cystourethrography. Rayopake is injected into the urethra alongside a Foley catheter that has been modified by the addition of radiopaque graduations within its wall. This procedure offers a means of obtaining a more accurate picture of the extent and configuration of prostatic enlargement than any other method save cystoscopy. The size and shape of the median and lateral lobes, the proportions of the intravesical and subvesical glands, and position of the prostate in relation to the bony landmarks are accurately estimated. The cystourethrograms are therefore of definite aid in selecting the particular type of operative procedure. Errors in measurement due to magnification of shadows upon the roentgenogram are avoided by means of the opaque graduations lying directly within the prostatic urethra. The catheter used for the measurements is inserted at the time of initial decompression and need not be changed until the time of operation.

Six roentgenograms; 1 drawing; 1 photograph.

Calculosis of the Seminal Vesicles. Jiří Marušiak. Acta radiol. et cancerol. bohemoslovenica **5**: 180–183, 1952. (In French)

In a 67-year-old male with enlarged prostate and a staghorn calculus of the right kidney, roentgen examination showed, in the lesser pelvis, above the horizontal part of the iliac bone and to the right of the median line, a series of calcific shadows, about 5 mm. in diameter, forming an arcuate line. This appearance indicated calculosis of the seminal vesicle.

The seminal vesicles are located above the prostate near the posterior-inferior wall of the bladder. Rarely they are the site of calculi, as a result of retained secretions or infection such as tuberculosis. While such calculi are usually asymptomatic, symptoms are sometimes present, including impotence, pain radiating to the perineum, dysuria, hematuria, painful defecation, and priapism. In certain cases operation may be indicated.

A little more frequent, though also somewhat rare, is calcification of the efferent ducts of the seminal vesicles, the calcium being deposited in the muscular layer of the wall. Obstruction due to a pelvic tumor or scrotal hernia may be an etiologic factor, while infections such as gonorrhea and tuberculosis are at times responsible. Some authors deny that senile changes cause this condition.

In the case presented, the symptoms were attributed to the enlarged prostate, the calculi of the seminal vesicle being regarded as merely an incidental finding.

CHARLES M. NICE, M.D.
University of Minnesota

THE BLOOD VESSELS

Arteriography: Serial Arteriography; Translumbar and Subdiaphragmatic Aortography. K. E. Loose. Fortschr. a. d. Geb. d. Röntgenstrahlen **76**: 173–180, February 1952. (In German)

During the past decade arteriography has become a necessity not only for diagnosis, but also, when the diagnosis is known, for determination of the extent of the disease process and the status of the collateral circulation. Technically the procedure is simple, relatively safe and, if serial films are obtained, productive of accurate diagnosis. For the lower extremity, 30 c.c. of 70 per cent Perabrodil (Diodrast) is injected rapidly following percutaneous needling of the femoral artery. It is important that the bore of the needle, the adapter of the syringe, and the syringe outlet all be at least 1.2 mm. in diameter. The dye is injected as rapidly as possible, with hand pressure. Should it be desired to visualize the entire lower extremity, two x-ray tubes mounted side by side, with one centered on the thigh and the other on the calf, are energized synchronously. Translumbar aortography for lesions regional to the bifurcation of the aorta, and subdiaphragmatic aortography for lesions of or regional to the kidney, can with practice be similarly performed.

Serial films are necessary in avoiding retakes because of inaccurate timing. Moreover, on a single film the advancing end of the contrast column within the artery so closely resembles an occlusion that the diagnosis of occlusion cannot be made unless some blood vessel distal to the suspicious area is in some manner visualized.

Nine roentgenograms; 1 photograph.

WILLIAM F. WANGNER, M.D.
Royal Oak, Mich.

Radiology in Peripheral Arterial Disease. John Wilkie. Proc. Roy. Soc. Med. **45**: 143–146, March 1952.

Cases of obliterative arterial disease can be classified into three groups (Boyd *et al.*: J. Bone & Joint Surg. **31**-B: 325, 1949. Abst. in Radiology **55**: 158, 1950): primary thrombosis of the popliteal artery, juvenile obliterative arteritis, and senile obliterative arteritis. The first two are commonly grouped together as thrombo-angiitis obliterans (Buerger's disease); according to Boyd, in patients under thirty-five, the thrombosis is due to trauma. Symptoms in the last group are ascribed to arteriosclerosis.

The present communication is based on a study of the arteriograms of the lower extremities of 142 patients, including 87 cases of arteriosclerosis and 36 of thromboangiitis obliterans. The author's technic of arteriography is described, and the abnormal arteriogram is discussed under the following headings: (1) alterations in contour of the vessels; (2) thrombosis and diminution in caliber; (3) number and size of the collateral channels; and (4) presence or absence of venous filling. The author concludes that arteriography does not help in the classification of clinically equivocal cases and that it "has little to offer in the study of peripheral arterial disease. While it will give fairly accurate indications of the site and extent of the lesion, it contributes little or nothing to the assessment of function, progress, or prognosis."

Eight roentgenograms.

D. D. ROSENFELD, M.D.
Fontana, Calif.

Value of and Indications for Endosseous Phlebography for Study of Venous Disturbances of Lower Limb. Phlebography by Puncture of Os Calcis. Antonio Rabaiotti. Ann. radiol. diag. **24**: 181–187, 1952. (In Italian)

The author has applied the technic of venography first described by Leger and Masse in *La presse médicale* in 1951. A stiff needle is introduced into the marrow of the os calcis followed by the injection of Diodrast or similar material. This technic allows simultaneous visualization of the deep, superficial, and communicating veins of the leg and thigh, as shown by the excellent roentgenograms accompanying this article.

The author discusses the advantages and disadvantages of this medullary injection and concludes that it should be used when intravenous phlebography is unsuccessful or contraindicated. General anesthesia is essential when the injection is made in the bone marrow because of painful reactions and muscular contractions which otherwise occur. Because of general anesthesia, it is impossible to place the patient in the erect position and therefore one cannot study the effect of the hydrostatic distention of the veins.

Three roentgenograms.

CESARE GIANTURCO, M.D.
Urbana, Ill.

Splenic Venography: Demonstration of the Portal Circulation with Diodone. B. Dreyer and O. E. Budtz-Olsen. Lancet **1**: 530–531, March 15, 1952.

A method is described for the roentgen demonstration of the splenic vein and part of the portal circulation by the injection of a radiopaque medium into the spleen without laparotomy.

After fasting and being given a mild hypnotic to allay apprehension, the patient is placed supine on the x-ray table. The skin over the splenic area is cleansed, and the tissues in the ninth intercostal space are infiltrated with a local anesthetic. A small lumbar puncture needle is attached to a syringe containing 20 ml. of 70 per cent Diodone warmed to body temperature. The patient is told to hold his breath; the needle is pushed medially, and slightly posteriorly, through the ninth intercostal space into the spleen, the engagement of the organ being usually distinctly felt. The Diodone is then rapidly injected. A roentgenogram is taken toward the end, but before completion, of the injection. This procedure had been employed in 11 cases without untoward incident. The spleen was palpable in all of them. Two patients subsequently came to operation, and no tear or other gross lesion of the spleen was found.

Several uses of the method are indicated and to show its value a case of thrombosis of the splenic vein is reported.

Two roentgenograms.

Thrombotic Occlusion of Aorta as Demonstrated by Translumbar Aortograms. Robert V. Elliott and Mordant E. Peck. J.A.M.A. **148**: 426–431, Feb. 9, 1952.

The subject of aortic thrombosis is reviewed and a detailed description of the methods used in translumbar aortography is given. Four cases in which the procedure was employed are reported.

The clinical findings—weariness and fatigue of the extremities, absence of a palpable pulse in either leg or groin, etc.—can usually mean one of three things: coarctation of the aorta, abdominal aneurysm, or thrombotic obliteration of the aorta. A positive diagnosis, particularly in the case of aortic thrombosis, can be established only by translumbar aortography, which serves also to reveal the exact location of the lesion. Aortographic examination is also of benefit in determining, preoperatively, whether or not resection of the aorta is feasible. An advantage of the translumbar approach, in contrast to retrograde aortographic examination, is its ability to delineate accurately the upper margin of the thrombus.

It is the opinion of the authors that translumbar aortography does not carry any undue risk when used in patients with aortic disease.

Four aortograms; 1 photograph.

A. WILSON BROWN, M.D.
Shreveport (La.) Charity Hospital

SPECIAL DIAGNOSTIC PROBLEMS

Simultaneous Occurrence of Malignant Tumors and Systemic Diseases. Hans E. Walther. Radiol. clin. **20**: 405–412, November 1951. (In German)

The coexistence of two different diseases in the same patient always presents a difficult diagnostic problem and is of particular interest to the radiologist. In 116 postmortem examinations since 1947, at the Institute of Pathology of the University of Zurich, of persons dying of systemic diseases of the lymphatic system and bone marrow, coexisting primary cancers with or without metastases were found in 15, or 9.2 per cent. These associated tumors were most frequent in lymphatic leukemia, for which the age distribution coincides with that of cancer; they were less common in myelogenous leukemia and lymphogranuloma. The primary cancers were found in the lungs, prostate, skin, kidneys, uterus, breast, stomach, and the esophagus.

The clinical diagnosis was made correctly in only half of the cases. The systemic disease and the cancer were found in the same organ in more than half of the 15 cases.

One photomicrograph; 1 chart; 3 tables.

EUGENE F. LUTTERBECK, M.D.
Chicago, Ill.

Fibrosarcoma of the Soft Somatic Tissues: A Clinical and Pathologic Study. George T. Pack and Irving M. Ariel. Surgery **31**: 443–478, March 1952.

The pathological and clinical features of 39 cases of fibrosarcoma of the extremities are analyzed. These cases were observed from 1931 to 1948 inclusive, and constituted 5.4 per cent of malignant neoplasms of the soft somatic tissues studied in the Mixed Tumor Service of the Memorial Cancer Center, New York City. As a rule, no etiological factors could be established in this series. In no instance could trauma be considered as the sole causative agent, although a number of patients did give a history of injury preceding the discovery of the tumor. A case of fibrosarcoma developing in a burn scar and another in a laparotomy scar are reported. In some instances a congenital relationship was suggested. Sarcomas developing in myositis ossificans and in irradiated tissues were also observed.

No characteristic symptom complex or characteristic roentgenographic appearance was noted. The usual finding on x-ray examination is a soft-tissue density at the site of a soft-tissue mass. Calcification may occasionally be present, but was not observed in this series

and is not considered of clinical importance. When fibrosarcomas arise from periosteum, they may produce atrophy and invasion of the bone, with a characteristic roentgen picture, or by pressure against the bone they may set up a bone reaction with cortical ebonization. Metastases to the chest are identified as localized homogeneous shadows with sharply defined borders. They are not infrequently solitary. Any patient having a fibrosarcoma with roentgenographic demonstration of a discrete density in the lung should be subjected to thoracotomy for possible resection, if the primary tumor is controlled or controllable.

Local recurrences were observed in 56 per cent of this series, usually because of inadequate initial excision. The absolute five-year survival rate was 59 per cent. The relative five-year survival rate was 65 per cent, and the therapeutic five-year survival rate was 81.3 per cent. Radical surgical excision is the one suitable method of ablating fibrosarcoma. Irradiation may be used to supplement surgical treatment or for palliation.

Fifteen figures, including 3 roentgenograms; 8 tables.

TECHNIC; APPARATUS

Fundamentals and Examples of Hard-Ray Technic. F. Wachsmann, K. Breuer, and E. Buchheim. Fortschr. a. d. Geb. d. Röntgenstrahlen **76:** 147–157, February 1952. (In German)

The use of high kilovoltages in diagnostic roentgenology is not new. As early as 1924 reports appeared on the use of kilovoltages up to 100, though this latter potential is now considered the lower limit in hard-ray technic. The past two years have seen a revival in interest in the higher kilovoltages.

While one advantage in the use of voltages in excess of 100 kv. for diagnosis lies in the very short exposure time required to produce proper film density, a still greater advantage is the lessened roentgen exposure to the patient. Two interrelated factors operate in reducing the patient dose. With the harder rays the quantity of radiation required per exposure, in terms of milliampere seconds, becomes so trivial that the well known greater ionization effect which one obtains with r-meter measurements of high potential radiation is counterbalanced. The second factor is the proportional increase in exit dose: the proportion of entrance dose to exit dose is reduced. As one progresses upward in kilovoltage toward 150, the side of the patient toward the tube receives less and less radiation, a greater percentage of the radiation traverses the body (an effect particularly pronounced in thick bodies), and the less total radiation is needed to produce the roentgenogram. For human tissue, going above 150 kv.p. does not yield so marked as increase in terms of exit dose percentage.

A drawback to hard-ray technic is loss in contrast, a loss which is quite marked between bone and soft tissue. On the other hand, it should be noted that there is no loss in contrast between soft tissue and air. The authors prepared aluminum objects of varying thicknesses, which were radiographed within a water phantom. Aluminum thickness differentials, here used as equivalent to bone, showed progressive loss of identification with increased kilovoltage. To study the air-to-soft-tissue relationship, holes of various sizes were drilled in plastic blocks. The holes were sealed in order to correspond to air-filled bronchi, and following this the plastic blocks were radiographed within the water phantom. With increase in kilovoltage, relatively less loss in contrast was found as compared with the aluminum studies. Actually, by the use of the proper grid, and even in face of the fact that grids are less effective at higher potentials, visualization of a smaller air space was obtained at 180 kv.p. than at 60 kv.p. Thus, with air-filled organs such as the lungs, one need not fear the loss of contrast with the higher kilovoltages.

Chest films at 60 and 150 kv.p., exposed at 2 meters distance, with grids and intensifying screens, are shown for comparison. The soft-ray film required 20 ma. seconds and subjected the tube side of the patient to 80 milliroentgens dosage, while the hard-ray film required only 2 ma. seconds with a skin dose of 25 milliroentgens. The authors consider the hard-ray film more diagnostic as well as safer for the patient. They found the poor visualization of the ribs rather a help than a hindrance, since the lung detail is not hidden behind bone.

Hard-ray technic should be applicable to such a study as that of the barium-filled stomach, since here an extreme in contrast would be evident with any technic. The illustrations of films exposed at 80 kv.p. and 150 kv.p. appear equal in interpretability, but not of the same esthetic appeal. The advantage lies in that, while the lower potential dosed the patient with 2,000 milliroentgens, the higher subjected the skin to only 165 milliroentgens.

Due to loss of contrast, the upper limit for bone studies is 110 kv.p., and even this is not too satisfactory. The hard-ray skull films were not quite so good as the conventional views. A view of the lateral lumbar spine was distinctly inadequate. Nevertheless, it is of interest that in both these regions the delineation of gas shadows against the soft tissues was sharper with hard-ray technic.

Thirteen roentgenograms; 4 graphs.

WILLIAM F. WANGNER, M.D.
Royal Oak, Mich.

Bronchoscopic Removal of a Foreign Body with the Aid of Triangulation Roentgenoscopy. Alfred A. Dorenbusch and Wendell E. Roberts. Ann. Otol., Rhin. & Laryng. **61:** 83–89, March 1952.

Triangulation roentgenoscopy as a guide to the removal of radiopaque foreign bodies has been previously described by one of the authors (Roberts: Am. J. Roentgenol. **52:** 327, 1944. Abst. in Radiology **44:** 527, 1945). Briefly it involves the use of two tubes under the fluoroscopic table on a single carriage, so that the central ray of either tube may be adjusted to any desired angle (cross-fire for triangulation). Each tube has its own filament control, thus making it a simple procedure to keep the amperage on each one equalized. This does not interfere with conventional roentgenoscopy, as the control panel is so wired as to permit the use of one or both tubes. Having two tubes activated simultaneously and with their central rays intersecting, two images of the foreign body will be produced on the fluoroscopic screen at all times.

The procedure has been found to be a valuable adjunct to forceps extraction of foreign bodies beyond endoscopic vision. A case is reported here which illustrates the practical use of the procedure in association with the Alnico bronchoscopic magnet. A white male, aged 37, accidentally aspirated a small nail held in his mouth. Roentgenograms revealed the foreign body in the right lung. A bronchoscopy was done, but the nail was found to be beyond endoscopic vision

After repeated attempts, it was eventually reached and withdrawn by an Equen Alnico magnet under the guidance of triangulation roentgenoscopy.

Six roentgenograms. STEPHEN N. TAGER, M.D.
Evansville, Ind.

The Tricardiograph: A Rapid Screening Method for Cardiac Disease. J. Leonard Brandt, William Dock, Robert Landsman, and Charles Passannante. Circulation **5:** 408–411, March 1952.

The authors describe briefly an apparatus called the "tricardiograph," attachable to a fluoroscopic screen carrier, which records simultaneously an electrocardiogram, a ballistocardiogram, and slit kymogram on a single 6 1/2 × 8 1/2-inch film. Only the left heart border is included. The device was designed to provide a simple and inexpensive method for detecting cardiac disease. One record is illustrated, but otherwise results are not given.

[The device is very ingenious but as it records only a single lead of the electrocardiogram, one wonders how efficient it will be. In conjunction with a miniature film of the chest, it would certainly aid in detecting cases of heart disease in surveys.—Z.F.E.]

One tracing; 2 drawings; 1 photograph.

ZAC F. ENDRESS, M.D.
Pontiac, Mich.

A New Injection Device for Angiography. Leonard D. Rosenman, Felix L. Pearl, and Charles Calvert. Surgery **31:** 200–203, February 1952.

The authors describe a simple device suitable for all forms of angiography, which enables the user to vary and control the amount, rate, and force of injection of contrast material. The apparatus consists of a cylindrical metal shell which houses a Robb type Luer-Lok glass syringe and a compression chamber which is fed by a tank of nitrogen gas. Metal stops permit the injection of any desired amount of contrast material. The plunger of the compression chamber is fitted to the plunger of the syringe in such a way that the latter cannot reach the bottom of the syringe barrel, thus preventing the shattering of the syringe by abutment of piston against barrel. A three-way stopcock at the distal end of the syringe is connected to a supply of heparinized isotonic solution and to the intravascular catheter; the latter opening may be used for filling the syringe with radiopaque solution for the angiogram. A second stopcock is placed at the proximal end where the compressed nitrogen enters the cylinder. By adjusting the metal stops and fixing the pressure of the injection, the rate and the amount of the injection are controlled. The pressure system is adjusted by a set of needle valves and manometers mounted around the top of a table. The system is connected to a tank of nitrogen which feeds the compression chamber of the injector and provides a force for a constant intravascular drip to keep the catheter free of clots between injections of contrast medium.

The apparatus differs from other pressure injectors in its method of controlling the x-ray machine and cassette changer. A sensitive microswitch is attached to the outside of the device. This can be moved up and down the length of the cylinder, and is tripped by the plunger of the syringe as it passes by. Its position along the cylinder permits the taking of films after any desired amount of medium has been injected.

Two photographs.

Some Information Concerning a New X-Ray Tube (Polyanodic Tube). Mario Lenzi. J. belge radiol. **35:** 221–225, 1952. (In French)

Professor Lenzi, director of the Institute of Radiology at the University of Modena (Italy), working in collaboration with an engineer, S. Colombo, has developed a polyanodic x-ray tube. In this tube eight anticathodes are placed in a circle, in the center of which are the eight corresponding filaments. The x-rays may be emitted simultaneously from all of the anticathodes or from one anticathode after another in rapid rotatory succession. Practically, one may consider the beam thus emitted as having the shape of an inverted cone, whose dimensions are limited by the location and dimension of collector diaphragms placed outside the tube. The aim of this tube is to concentrate an intense beam at a certain depth for radiotherapy.

Two photographs; 1 roentgenogram.

CHARLES M. NICE, M.D.
University of Minnesota

Measuring and Centering Device for Use on X-Ray Machine. Milton S. Ross. Arch. Dermat. & Syph. **65:** 231–232, February 1952.

The author describes a device to be used on the tube head of the profexray® low-voltage x-ray therapy apparatus. It is intended to simplify centering the x-ray beam and measuring the focus-skin distance.

One photograph.

Reproduction of X-Rays on 35 mm. Film. Norborne B. Powell. J. Urol. **67:** 397–402, March 1952.

The author describes a method of reproducing roentgenograms of all sizes on 35-mm. film for use by the average urologist with a minimum of equipment and expenditure of time.

Four illustrations.

Telognosis. Three Years of Experience with Diagnosis by Telephone-Transmitted Roentgenograms. J. Gershon-Cohen, M. B. Hermel, H. S. Read, Bernard Caplan, and A. G. Cooley. J.A.M.A. **148:** 731–732, March 1, 1952.

The transmission of facsimile roentgenograms by telephone or radio has been under trial now for five years. [For an earlier account, see Gershon-Cohen and Cooley: Radiology **55:** 582, 1950.] The apparatus consists of a transmitter which scans x-ray films for electrical transmission to a receiver which reproduces facsimiles reduced to half the size of the original. If a telephone circuit is used, the same circuit may be employed for sending facsimiles and for consultations or reports of the x-ray findings. There is no limit to the distance over which the facsimiles may be transmitted. Shortwave radio transmission is equally efficacious with telephone transmission.

The costs involved are low, and it is believed that rural hospitals which cannot afford either a full-time radiologist or a radiologic consultant under present circumstances may profit by this procedure when equipment becomes available. The system might also prove useful in teaching, and in military outposts, ships at sea, and countries where few radiologists are available.

Two roentgenograms.

DONALD DEF. BAUER, M. D.
Coos Bay, Ore.

ROENTGEN AND RADIUM THERAPY

Cancer of the Gums. Charles L. Martin and Edward J. Craffey. Am. J. Roentgenol. **67**: 420–427, March 1952.

Carcinoma limited to the gums is rare, but the authors found gingival involvement in 40 per cent of 218 consecutive cases of cancer of the mouth treated three or four years previously. These lesions were usually secondary extensions. The gums alone were involved in only 13 cases.

For the treatment of these lesions low-intensity radium needles which produce a constant output of gamma rays are stitched in position for a period of seven days. Some of the various implantation patterns are illustrated. Each implantation is so arranged that all of the malignant tissue receives doses varying from 6,000 to 12,000 gamma roentgens. The distribution of the needles must insure adequate dosage to tumor which is invading surrounding structures, such as the cheek, floor of the mouth, tongue, anterior pillar, palate, etc. When lymph-node metastases are present, they are treated by low-intensity radium needle implantation and roentgen irradiation (See Martin: Radiology **55**: 62, 1950). Surgery is used only to remove areas of irradiation necrosis or patches of uncontrolled cancer.

Of the 87 cases in the present series, all were relatively low-grade squamous-cell carcinoma except one basal-cell tumor which had extended from the lower lip to involve the lower gum. The average age of the patients was sixty-four years, but 35.6 per cent were seventy or older. In 25 per cent there was invasion of the bone. In 24 per cent cervical lymph nodes were palpable on admission, and in 13.7 per cent they became palpable at a later date.

Results were very good, with 40 per cent of the patients well after five years or more. Complete healing of the primary lesion occurred in 72.4 per cent. Irradiation necrosis was observed in only 12 patients (13.7 per cent), and 8 of these are well after five or more years. Surgical removal of bone and soft tissues damaged by irradiation was necessary in 8 cases, but it is felt by the authors that this damage might have been prevented. Not all cases having bone involvement showed good results, but in 7 there was complete healing of the gums; recurrence was noted in 2 of these patients after a considerable time.

The authors feel that their good results have been obtained with less radionecrosis of soft tissues and bone than is produced by external or intra-oral roentgen radiation.

Five roentgenograms; 8 photographs; 6 drawings; 4 tables.

W. LITTLE, M.D.
Indiana University

Cylindroma in Nose and Sinuses. Robert S. Pollack. Arch Otolaryng. **55**: 210–217, February 1952.

The histologic entity most commonly called cylindroma, but known also by a variety of other names (adenoid cystic basal-cell carcinoma, adenocarcinoma of cylindroma type, adenomyoepithelioma, and cellular mixed tumor), is encountered wherever salivary or mucous glands are found. Some writers do not accept cylindroma as a cancer. Ackerman and del Regato classify it with the semimalignant tumors but say that it is much more malignant than is generally suspected. Unfortunately, the insidious nature of cylindroma is not recognized by many clinicians. Five cases are reported, 2 in detail. Four of the patients were young women, all but 1 below thirty-three years of age.

Infiltration along nerve sheaths and nerve trunks, an outstanding characteristic of the tumor, produced sensory loss which was an early presenting symptom in 2 cases. Its infiltrative character is further indicated by the widespread local invasion of bone and musculature, which in each patient produced orbital signs and symptoms as well as trismus. Pain was a late feature in 1 patient and negligible in the other. The difference in duration of the clinical course in these 2 patients emphasizes the variable life history. There was, however, no difference in the ultimate termination with widespread metastases. The patients whose tumors were nasal and nasopharyngeal in origin also showed differences in the duration of the clinical course, but with similar end-results.

The location of the tumor in a surgically inaccessible area makes treatment especially difficult. The persistent and relentless nature of recurrences over a period of years, well demonstrated by one of the cases reported here, suggests a very guarded prognosis for all patients with this type of tumor, with more radical measures as the initial form of treatment. Roentgen therapy was employed in all of the author's cases, with only moderate response. All of the patients were dead or dying at the time of the report.

Two roentgenograms; 2 photomicrographs.

Roentgen Therapy in Cancer of the Larynx and Hypopharynx. R. M. Caulk. Am. J. Roentgenol. **67**: 443–446, March 1952.

This report is based on 92 cases of cancer originating in the larynx and hypopharynx which were treated primarily by roentgen therapy; 63 of these have been followed for a sufficient period to obtain five-year survival figures.

A correlation of survival rate and anatomic site of origin is made. For this purpose, all subglottic lesions are regarded as variants of true cord cancer. Of 16 early true cord lesions without fixation treated prior to 1946, 11 were cured for five years or more, regardless of size. Fixation of the cord indicates advanced disease and lowers the survival rate (2 of 6 cases in this series). Cancer arising in the vestibule yielded only 2 five-year survivals (1 of 5 early cases and 1 of 9 advanced). Such lesions may become quite large before producing symptoms and usually present as advanced cancer. Likewise, lesions arising from the free border of the epiglottis and/or the aryepiglottic fold tend to become advanced before producing symptoms, and prognosis is poor. In this series, none of 6 patients with cancer of epiglottic origin, and only 1 of 6 with disease arising in the aryepiglottic fold, survived five years. When the disease began in the postcricoid region, the initial symptom was referable to the gastrointestinal tract in all cases, and in most instances hoarseness developed prior to treatment. None of the patients with both dysphagia and hoarseness as presenting symptoms lived five years; there was a single five-year survival in the entire group of 10. In 8 cases the growth originated in the posterior pharyngeal wall. Most of these cases were advanced when first seen, and all terminated fatally within five years.

The author's technic of treatment is outlined.

Generally, tumor doses of 5,000 to 5,600 r were given in twenty-one to thirty-six days.

From this series, it is concluded that advanced cancer of the larynx and hypopharynx offers a poor prognosis from the standpoint of roentgen therapy. History of previous tracheotomy, hoarseness and dysphagia occurring concurrently, or dysphagia occurring alone indicates a poor prognosis.

One illustration; 1 table.

RICHARD A. SILVER, M. D.
Indiana University

Parotid Gland Tumors. T. Howard Clarke. S. Clin. North America **32:** 175–193, February 1952.

This paper is meant to be a guide to the treatment of parotid tumors. These are classified simply as (1) metastatic and (2) primary, the latter including benign epithelial tumors, malignant epithelial tumors, and a miscellaneous group made up of lipoma, angioendothelioma, fibrosarcoma, and lymphosarcoma. While mixed tumor is grouped with the benign lesions, the author inclines to agree with those who would classify it as malignant because of the possibility of metastasis.

The relationship of the facial nerve to the parotid gland is discussed and the role of the lymph nodes in diagnosis and treatment is considered. Often on physical examination it is impossible to tell whether a parotid swelling is due to a primary parotid tumor or is the result of secondary tumor invasion of the nodes. In treating metastasizing parotid tumors the regional lymph nodes must be explored and as a rule should be removed.

Sialography as a diagnostic procedure has been abandoned by the author, as he feels that it adds no reliable information which might lead to modification of the surgical attack.

Adequate surgery is considered the proper method of treatment, and the exact technics used for simple parotidectomy, total parotidectomy, radical parotid excision, and external carotid artery ligation are outlined. Radiation therapy is useless for mixed tumors. It succeeds merely in injuring the overlying and surrounding tissues, making ulceration more certain and subsequent surgery more difficult. Most important of all, it is a time-consuming diversion. In carcinoma of the parotid the author uses postoperative irradiation, usually beginning within five to ten days after operation, depending upon the rate of wound healing and the amount of fluid in the wound. If at the time of operation the entire tumor cannot be removed, radon seeds are implanted. The most serious complication due to radiation is extensive necrosis.

In the summary the author stresses the fact that these tumors are not rare, that their classification remains a controversial issue, and that malignant parotid tumors are cured only if the entire primary lesion and secondary deposits are removed.

Twelve photographs; 5 photomicrographs; 5 drawings.

A. WILSON BROWN, M.D.
Shreveport (La.) Charity Hospital

Ten Years of Preoperative Radiation Therapy of Breast Carcinomas. A. Kohler. Strahlentherapie **88:** 150–163, 1952. (In German)

On the basis of various reports from the literature, the author states that Steinthal's clinical classification of mammary carcinoma is not decisive as a guide to therapy, since in a third of the cases without a palpable mass histologic examination reveals carcinomatous lymph nodes (Stage II).

Postoperative prophylactic irradiation prolongs the survival time and reduces local recurrences but does not influence the appearance of distant metastases. The author advocates preoperative irradiation, which may result in (1) immediate protection against formation of metastases; (2) inactivation of cancer cells which might be spread by operation; (3) immunization of the operative field against inoculation. The technical factors are 180 kv., 0.75 mm. Cu plus 1 mm. Al filter, three to five fields, with a daily dose of 200 r per field, up to 4,000–4,500 r at the chest wall and axilla and 3,600 r to the supraclavicular groove, in twenty-four to twenty-eight days. The skin reaction heals in ten weeks after institution of irradiation, and at that time operation must be performed. Irradiation does not complicate surgery; rather it often makes the tumor operable.

In 270 cases receiving preoperative irradiation, the author had 63 five-year and 30 ten-year survivals, while of 336 patients irradiated postoperatively only 49 lived five years and 25 ten years. Among 130 cases treated solely by irradiation there were 34 five-year survivals. On this basis, preoperative irradiation is considered the preferable procedure. It might be supplemented by postoperative radiation in some cases.

Seven illustrations; 4 tables.

LEWIS L. HAAS, M.D.
Chicago, Ill.

Treatment of Ulcerating Carcinoma of the Breast. Hugo Vernár. Acta radiol. et cancerol. bohemoslovenica **5:** 137–149, 1952. (In English)

An inoperable ulcerated carcinoma of the breast was treated by roentgen irradiation, 16,610 r being given in eighty-four days. The ulceration, which had involved an area as large as a man's hand, healed and the mass became smaller and freely movable. No regional lymph nodes were palpable. A radical mastectomy was then undertaken. Axillary lymph node involvement was discovered and the amputated breast showed medullary carcinoma with little evidence of post-irradiation change.

The authors advise prolonged preoperative irradiation for such cases, followed by radical mastectomy. They did not find that the irradiation interfered with the subsequent operative procedure.

Experiences and Results of Roentgen Therapy of Bronchial and Lung Cancer, Respectively. R. Bauer and H. Hartweg. Strahlentherapie **88:** 8–33, 1952.

Lung cancer is believed to be increasing in frequency. In the autopsy material of the University of Tübingen it was found to constitute 25 per cent of the cancer cases. Operability can be determined only by exploratory thoracotomy. Radical removal is possible in about 10 to 15 per cent of the cases. Following this, the five-year survival rate, as reported in the literature, varies between 20 and 28 per cent. Lezius estimates it as 10 per cent at best, while K.H. Bauer believes that the absolute five-year survival following surgery represents at most 1 per cent of all lung cancer cases. The operative mortality of leading chest surgeons is 20 to 30 per cent (Frey)

The present authors observed 228 cases between 1937 and 1950. Of these, 105 were treated by irradiation,

and data on 90 cases could be analyzed; 30 cases were verified histologically. Three patients survived five years. The mean survival time for non-irradiated cases was 6.3 months; for irradiated cases 16.8 months (without initial metastasis 23.4 months). Clinical improvement could be established in 57 cases after irradiation. The technic was individually selected. With increasing dose, the survival time also increased. It was 4.5 months with less than 7,000 r total surface dose; 22.4 months with doses in excess of 9,000 r.

Nitrogen mustard produced no improvement. The importance of post-irradiation care, early diagnosis, and early institution of irradiation is stressed.

Seventeen roentgenograms; 2 graphs; 6 tables.

LEWIS L. HAAS, M.D.
Chicago, Ill.

Carcinoma of the Esophagus. A. J. Delario. Am. J. Digest. Dis. **19**: 50–54, February 1952.

This paper is a review of carcinoma of the esophagus based on the literature, from which the author quotes extensively. He reports no cases of his own.

Most esophageal carcinomas are of the squamous-cell type. They ulcerate easily and cause obstruction fairly early. They are prone to metastasize early and to spread by extension beyond the wall of the esophagus. The diagnosis is most often made by the x-ray examination following a complaint of food "sticking" in the throat, or on routine examination of the esophagus in patients referred for roentgen study of the stomach.

There are many contraindications to surgical removal of carcinoma of the esophagus and the postoperative mortality is high. Results with roentgen therapy have improved in recent years, due largely to the use of multiple ports and rotation therapy. For the multiple-port technic, 12 or 14 fields, 10 × 10 cm., are used, each receiving in divided doses 2,000 r in air, giving a dose to the esophagus of about 6,500 r. Between 100 and 175 r are given to each of two ports each day, and the total treatment time is about five weeks.

Rotation therapy is particularly suited to carcinomas of the esophagus. The turn-table technic, where the patient is turned about once a minute, gives good results. A total tumor dose of about 5,000 r given over thirty to forty days has been said to yield the best results. Nielsen (Acta radiol. **26**: 361, 1945. Abst. in Radiology **47**: 100, 1946) had 25 per cent one-year survivals and 15 per cent two-year survivals with this method as compared to 10 per cent and 4 per cent, respectively, with treatment without rotation.

Radium therapy for esophageal carcinoma has been practically abandoned. In many cases though the carcinoma was destroyed, perforation of the esophagus and a fatal mediastinitis resulted.

Two tables.

JOSEPH T. DANZER, M.D.
Oil City, Penna.

The Curability of Carcinoma of the Cervix in the Negro. Manuel Garcia. South. M. J. **45**: 145–150, February 1952.

The author has made a study of the radiocurability of carcinoma of the cervix in the Negro, using as controls a group of white persons seen concurrently and treated, as nearly as possible, in the same manner. The entire series (white and colored) included 1,203 consecutive cases examined in the Department of Therapeutic Radiology, at the Charity Hospital of Louisiana at New Orleans. Cases with the diagnosis of carcinoma "*in situ*," sarcoma, and lymphoma were eliminated.

The results in the Negro were found to be consistently poorer than in the white patients: 27 per cent five-year cures in the former as compared with 34 per cent in the latter group. This does not appear to be due to impaired radiosensitivity, for as a result of improved methods a fairly satisfactory result was obtained. Because of their economic and educational background, Negroes have the disease at an earlier age, with a greater incidence of infection and more malignant tumors. They neglect symptoms longer and therefore have a greater proportion of advanced lesions. They have a higher incidence of complications and intercurrent disease, and consequently a lower life expectancy. They refuse to complete treatment in many instances and the number lost to follow-up is greater.

From the ten-year results it is apparent that after the fifth year, the incidence of recurrence is small.

Seven tables.

JOHN M. KOHL, M.D.
Jefferson Medical College

Primary Carcinoma of the Female Urethra. George A. Hahn. J. Urol. **67**: 319–325, March 1952.

Since 1931, 10,851 cases of all types have been studied at the American Oncologic Hospital, Philadelphia, an institution devoted to the diagnosis and treatment of malignant neoplasms. Among the 10,851 cases there were only 3 in which the diagnosis of primary carcinoma of the female urethra could be confirmed by histologic study. These 3 cases are reported in detail.

In the first case a mistaken diagnosis of urethral caruncle had apparently been made, with at least three attempts at removal. The patient was treated successfully by means of deep x-ray cone therapy and intra-urethral contact radium. Her only difficulties have been episodes of urinary retention relieved by dilation of the urethra and finally by the use of an inlying catheter for eight days. She is free of the disease after eleven years and five months.

The second patient had an anaplastic carcinoma of the urethra, transitional-cell type, with apparent pulmonary metastases. Because of her generally poor condition and the necessity for radiation therapy to the chest and left supraclavicular area, the urethral growth assumed secondary importance. The general condition improved remarkably, thoracenteses ceased to be necessary, and the urethral lesion responded well to local radium irradiation. The patient died of pneumonia nine months later and no information was available concerning the condition of the urethra.

In the third case, a history of a bloody vaginal discharge suggested a gynecologic basis for the complaints. Dilatation of the cervix with fractional curettage of the cervix and endometrium revealed no evidence of cancer, but "stripping" of the urethra produced bleeding. Dilatation of the urethra disclosed a 1.0–1.5 cm. area of pocketing on the left posterolateral portion, just within the urinary meatus. A biopsy showed epidermoid carcinoma of the squamous-cell type. Radium was applied intra-urethrally on two occasions for 250 and 300 mg. hr. Two years later there was no evidence of residual disease.

The importance of examination of the urethra and bladder, even in patients with complaints of an apparent gynecologic nature, is emphasized.

Three roentgenograms; 3 photomicrographs; 1 photograph.

Radiation Therapy and Prognosis of Lymphogranulomatosis. R. Haubrich. Strahlentherapie **88**: 102–116, 1952. (In German)

The treatment of lymphogranulomatosis is an unsolved problem. Whatever therapeutic procedure is employed, the result may be only palliative, without final cure. The author's material comprises 97 irradiated cases, of which 83 could be evaluated. Solitary lesions occurred in only a few instances. In the beginning, bony lesions were evident in 3 cases; the spleen was enlarged in 18 patients.

The prognosis was independent of the initial localization of the disease. The mean survival time was thirty months after the institution of irradiation. Sixteen patients survived five years, 1 patient ten years. Nine patients were alive without symptoms at the time of the analysis. Larger tumor doses resulted in a significantly longer survival time than smaller palliative dosage if treatment was started in the early stages of the disease and was limited to a solitary group of nodes or to adjacent lesions in the upper or lower half of the body. In more advanced stages, the result did not differ with the two methods.

The survival time was much longer when the patient initially had no general symptoms, *e.g.*, fever, itching, etc. Leukopenia is not regarded as a contraindication to irradiation; rather, it is believed that radiation may bring the white cell count to normal. It was observed that non-irradiated lymph nodes regressed after local treatment of distant nodes in some cases.

One graph; 6 tables. LEWIS L. HAAS, M.D.
Chicago, Ill.

Neurogenic Sarcoma Treated by Surgery and Radiotherapy. Edward S. Murphy, William R. Lipscomb, and John S. Bouslog. J. Neurosurg. **9**: 214–218, March 1952.

A review of the literature of the past two decades on neurogenic sarcoma and the case reported by the authors emphasizes the malignant growth characteristics of that tumor. Its tendency to reappear after attempts at removal is coupled with the quite general view that it is radioresistant. The authors' case, however, indicates that in at least some instances radiotherapy in conjunction with surgery is clinically effective.

A woman of 48 years was admitted to the hospital in June 1946, complaining of pain in the left leg of eight months duration. The pain originated in the left popliteal space, traveled downward, and was accompanied by "considerable twitching" of the leg. Examination showed tenderness and swelling in the left popliteal space. Roentgenography revealed a soft-tissue mass in this region; the bone was uninvolved except for osteoarthritis of the knee joint. At operation a fusiform tumor was removed with 6.5 cm. of the tibial nerve. The nerve ends were then dissected free and an end-to-end anastomosis was accomplished with the leg in a flexed position. The peroneal nerve had become involved in the periphery of the tumor but was easily shelled out from it. Surrounding connective tissue was also cleaned out. The pathologic diagnosis was "malignant tumor of the nerve trunk, structure consistent with either cellular anaplastic neurosarcoma or sympathicoblastoma."

Between July 25 and Aug. 7, 1946, 1,482 r (in air) was delivered through two ports to the left knee (400 kv., 70 cm. distance, 2.25 mm. Cu filtration). Between July 30 and Aug. 6, 1946, with the same physical factors, 741 r was delivered to an anterior port, left groin. Between Sept. 23 and Sept. 27, 1946, 988 r was delivered to two ports at the left knee and between Sept. 24 and 27, 1946, 494 r was delivered to the anterior port over the left groin.

In June 1948, a chest roentgenogram showed a large rounded mass in the right hilar area. Other smaller spherical dense areas were scattered throughout both lungs. The bones were intact. Between Feb. 1 and Feb. 11, 1949, 1,984 r was given to three chest ports, (200 kv., 50 cm. distance, 2.25 Al filtration). Between Aug. 17 and Aug. 22, 1949, with the same physical factors, 744 r was delivered to two ports, anterior and posterior right chest, and in the same period and with the same physical factors, 744 r was delivered to two ports, anterior and posterior, in the left knee region. X-ray examinaton showed clearing of many of the metastatic pulmonary processes previously described but there was a large single lesion in the upper portion of the right lung. An upper right lobectomy was performed on Aug. 25, 1949. The pathologic diagnosis was neurogenic sarcoma.

In April 1950, the patient was readmitted, with a small tender tumor at the site of the old lesion of the thigh. This was excised; it was not attached to any nerve. The pathologic diagnosis was neurosarcoma. The patient remained symptom-free until June 1951, when she suddenly became unconscious. She died five days later, and necropsy revealed cerebral thrombosis with concomitant encephalomalacia. A small nodule of tumor tissue was found in the upper lobe of the left lung.

Two roentgenograms; 3 photomicrographs.

Treatment of Birthmarks with Special Consideration of Cavernous Hemangioma. George E. Pfahler. Fortschr. a. d. Geb. d. Röntgenstrahlen **75**: 141–160, (Sonderheft) December 1951. (In German)

The author reports his methods and results in 760 patients treated for birthmarks over a thirty-two-year period. He states that, although certain general rules of procedure may be followed, each case must be appraised and treated on an individual basis. It is a serious mistake to believe that a "routine treatment" may be applied in the therapy of birthmarks. Each location—face, nose, eyelids, scalp, mucosa, bone, and viscera—brings up problems peculiar to itself. The therapist will obtain best results when guided by his own experience and training. Many methods and agents have been recommended, including radium, superficial and deep roentgen irradiation, contact irradiation, grenz rays, thorium X, surgery, fulguration, and carbon dioxide snow. This multiplicity of methods indicates that no single type of treatment has proved its superiority for all cases. In general the caustics lead to scar formation; radiation directly applied usually leaves no significant scarring.

The strawberry form of hemangioma, when small, may be successfully treated by carbon dioxide snow or fulguration under local anesthesia. The remaining scar is usually not significant. In many superficial lesions, radium is considered the treatment of choice, a 5- or 10-mg. plaque being used and single applications of 50 to 80 per cent of an erythema dose being given, repeated in six to eight weeks. For thicker lesions, radium filtered through 1.0 to 2.0 mm. of aluminum may be employed. For deeper lesions, plaques and

light filtration are not particularly recommended, as a heavy scar may result. In these cases, radium needles are frequently used.

The treatment of infants offers considerable difficulty, especially in the case of lesions about the lips, gums, tongue, etc.

Irradiation has its disadvantages. Whenever possible, it is to be avoided about the testicles and ovaries. Here fulguration is considered the treatment of choice. Lesions of the scalp are often better handled by electrocoagulation, because of the risk of alopecia. The danger of radiation damage to the epiphyses of young subjects must be borne in mind. Repeated dosages may be dangerous and, if doubt exists as to the total, it is better to desiccate or remove surgically, with suture of the wound or skin transplant.

The author favors fulguration in wart-like and hairy lesions under local novocain anesthesia, with care not to damage the surrounding normal tissue and cause scar formation. Electrosurgery with the bipolar method is used frequently in deeper lesions. The cutting current is preferred, without the production of flame, and the wound is sutured, usually with primary healing. Hemangioma of the vertebral bodies gives a typical x-ray picture and x-ray treatment is recommended.

Numerous case reports demonstrate the individual methods used. The excellence of the results shown proves the value of individualizing each problem.

[Much of this material, including many of the illustrative cases, appeared in Radiology **46**: 159, 1946.—Ed.]

Forty-four photographs. E. W. SPACKMAN, M.D.
Fort Worth, Texas

Nasopharyngeal Radium Treatment: A Follow-Up Study of 263 Patients. Walter E. Loch and Newton D. Fischer. Ann. Otol., Rhin. & Laryng. **61**: 198–205, March 1952.

The primary aim of the investigation reported here was to present the objective findings and late clinical results of nasopharyngeal radium therapy as advocated by Curtis and Burnam, and to discover any possible tissue changes which might be attributable to irradiation, such as telangiectasis, chronic infection, or crust formation.

Eighty-five patients were re-examined three to twenty-nine years after radium treatment and no late detrimental effects of irradiation or any other visible tissue pattern due to the treatment were discovered. In all patients the pharyngeal orifice of both eustachian tubes was clearly visible and of normal configuration. No sign of atrophy or abnormal patency was seen. In every instance the lymphoid tissue that remained had lost the irregular, ragged appearance of enlarged or infected adenoids. Neither the time that had elapsed since the treatment, the number of treatments, nor the age and sex of the patient had any apparent influence on the findings.

For evaluating the functional results of treatment, replies to 177 questionnaires were considered along with the actual re-examinations. The authors summarize their observations as follows:

"The late results of radium treatments are very encouraging. As one would expect, the best results were obtained in patients whose symptoms were due to infected lymphoid tissue and mechanical interference with the function of the eustachian tubes.

"Hearing was usually improved following these treatments provided the impairment was not due to otosclerosis or a chronic adhesive middle ear process that interfered with the movement of the ossicular chain. We do irradiate the nasopharynx in selected cases with known otosclerosis or with a perceptive type of hearing impairment. The object of treatments in this group of patients is not to restore the basic hearing defect, but to help protect what hearing the patient has and to prevent further loss from colds, acute and chronic nasopharyngitis and interference with the function of the eustachian tubes. In such cases the combined use of an antibiotic to cure the infection and irradiation, to remove or change the contour or flatten out the crypts to prevent reinfection, is more satisfactory than either of these measures used alone."

Four tables. STEPHEN N. TAGER, M.D.
Evansville, Ind.

TECHNIC

The Grid Technique of Radiotherapy with Depth Dose Measurements. Oscar H. Cohen and William L. Palazzo. Am. J. Roentgenol. **67**: 470–476, March 1952.

Depth-dose curves for three different types of grids were obtained by densitometric technics. The densitometry readings were compared with dosages obtained through a conventional 10 × 15-cm. portal. The grids used were as follows: (1) 10 × 15-cm., with perforations 1-cm. square at 1-cm. intervals, allowing 50 per cent of the total area covered by the grid to be exposed; (2) 10 × 15-cm., with square perforations of 2 cm., and intervals of the same size, also exposing 50 per cent of the total area; (3) 10 × 15 cm., with 1 cm. perforations, but allowing only 26 per cent of the area to be exposed. With none of the grids was the depth dose equal to that obtained under a 10 × 15-cm. open portal. The first grid, with openings of 1 cm. and exposure of 50 per cent of the underlying area, was found to be the most practical type. With such a grid, the relative depth doses are higher than with the other two, and there is less difference in dosage under the exposed and covered areas. This difference is greatest immediately beneath the exposed and covered portions of the grid, but lessens at increasing depths, the dosage approaching homogeneity at levels below 5 cm. Several interesting roentgenograms and graphs are included to illustrate the findings.

Grid therapy finds its greatest value in treating deep-seated lesions. Its use is not practical in relatively superficial lesions unless a second reciprocal grid is employed, which involves the occurrence of symmetrical "hot spots" in the depth.

Thirteen illustrations. RICHARD A. SILVER, M.D.
Indiana University

Depth Dose Investigation for Perforated Grid Therapy at 200 Kilovolts. Lillian E. Jacobson and Ansel Lipman. Am. J. Roentgenol. **67**: 458–469, March 1952.

Depth-dose measurements for a perforated grid were made in a masonite presdwood phantom. A small-air-volume 250-r Victoreen ionization chamber and a large-air-volume 25-r Victoreen ionization chamber were used. The 250-r chamber could be placed with its air volume directly under the center of a grid opening so as to measure the direct radiation. Subsequent

readings were taken with the chamber under the covered portion of the grid so as to measure the secondary radiation. The 25-r chamber, with its larger air volume, could be positioned so that half of its volume was exposed to an open portion of the grid and the other half covered by a closed portion, thus averaging the radiation coming through the surface of the grid.

The average of the two readings with the 250-r chamber for a particular depth and field size was found to agree rather closely with the results obtained with the 25-r chamber, indicating that either method could be used for obtaining average dose measurements at a given depth. The "average" has no physical significance, however, since portions under the holes receive more radiation at all levels than portions underneath the closed portions. The difference decreases as the depth increases because secondary radiation becomes a more important factor. It was found that, if the depth doses are known at one distance, the depth doses at other distances can be calculated by use of the inverse-square law.

Several tables are supplied showing comparisons between the two chambers, and also comparison of depth doses with and without grids for various conditions. The observations are also compared with data of other investigators.

Four roentgenograms; 1 photograph; 6 depth-dose curves; 8 tables.

J. DURLACHER, M.D.
Indiana University

Clinical Experiences with Teleradium Apparatus Containing 3 Grammes of Radium Equivalent. Zdeněk Hlasivec. Acta radiol. et cancerol. bohemoslovenica **5**: 150–159, 1952. (In English)

This paper from the State Radiotherapy Institute at Prague describes a teleradium apparatus which produces radiation equivalent to 3,050 mg. of radium, with a total filtration of 1.8 mm. lead and a focal skin distance of 8 cm. With a circular field 57 mm. in diameter, the output on the skin is 6 r per minute; the dose at 3.6 cm. depth is 50 per cent of the superficial dose.

A variety of malignant and benign lesions have been treated. The author found this type of irradiation to be most useful for palliation, postoperative prophylactic therapy, and the treatment of benign conditions.

Five tables; 2 isodose curves.

RADIOISOTOPES

Radiography of the Human Body with Radioactive Isotopes. W. V. Mayneord. Lancet **1**: 276–278, Feb. 9, 1952.

In 1950, the author suggested the possibility of using a strong radioactive source as a radiographic focus placed inside the body to obtain unconventional views of structures often confused by superimposition with the usual radiographic technics. In industrial radiography a gamma-ray source of low energy, thulium^{170}, had been shown to possess a number of advantages in the study of light alloys (West: Nucleonics **9**: 76, September 1951), and this isotope was therefore selected for the studies described in the present paper.

Thulium^{170} emits gamma rays having an energy of 84 kv., in addition to beta rays. The beta rays may be divided into two groups having maximum energies of 884 and 968 kv. respectively, most of the beta particles (76 per cent) belonging to the second group. The present belief is that thulium^{170} disintegrates by two routes: one high-energy beta-ray group going directly to ground-state ytterbium^{170} and the other going to an excited state of ytterbium^{170}, which then emits the 84-kv. "x-rays." The gamma rays are partially absorbed ("internally converted") in the outer electronic shell of the nucleus from which they are emitted, with the result that characteristic x-rays of ytterbium are also present. Moreover, the high-energy beta rays produce penetrating x-rays of relatively high voltage, from any material surrounding the thulium. The radiation coming from the material consists therefore of a mixture of gamma rays of 84 kv., characteristic x-rays of ytterbium with energies in the region of 50 kv., and also penetrating components making up a small fraction of the total radiation. While much more information is required before it can be accurately stated what radiation is in fact emitted, there is no doubt from the results obtained that the bulk of the radiation is gamma rays of about 84 kv. quantum energy with ytterbium x-rays added.

For the preliminary experiments, chips of thulium oxide, weighing only a few milligrams, were used in the bottom of a small glass tube into which they were sealed by an ebonite rod which fitted the tube. This rod had a small depression in its end, thus effectively making a point source at the bottom of the tube. "Perspex" was used to cut out the intense beta radiation. Films are reproduced of a mandible of a dried skull with the thulium source in the mouth and of a maxilla and mandible with the thulium source in the nasopharynx. Another film shows part of a metacarpus of a living hand taken with the thulium source at 6 cm. and with five minutes exposure. While the photographs are satisfactory, long exposures are at present necessary.

Low-energy radiators of this type have many possibilities, *e.g.*, in scanning technics, localizing foreign bodies, etc. A fuller account of these developments will be published elsewhere. [See Brit. J. Radiol. **25**: 517, October 1952.]

Effect of Radioactive Materials on Environmental Health. Conrad P. Straub. Pub. Health Bull. **67**: 298–305, March 1952.

In relation to radioactive materials the chief concern of public health officials is the discharge of wastes incident to operations by the Atomic Energy Commission into the environment beyond the areas controlled by the Commission, discharge into the sewage system of radioisotopes from hospitals and research institutions, and the industrial use of radioisotopes in manufacturing processes, industrial radiography, etc. The present paper concerns this problem as it exists in Georgia, but the observations are applicable elsewhere.

Co^{60} will not be discharged as a waste, but unless precautions are taken to protect personnel from its ionizing radiations it may prove hazardous. At 1 foot the thickness of lead required for shielding is 17.5 cm.

I^{131}, P^{32}, N^{24}, and Cl^{36} could conceivably be discharged into the sewage system after use for thera-

peutic or research purposes. Calculations indicating the methods of evaluating the hazards from these isotopes are given, and a table shows the volumes of water required to reduce the wastes to tolerance levels.

After administration of I^{131}, large quantities are excreted in the urine, and this is the source of the bulk of radioactive wastes resulting from the use of this isotope. Taking into consideration the dilution by the flow in the sewer and the short half-life of the isotope, there is little likelihood of any radiation hazard from this source. In fact, until the use of radioisotopes becomes much more widespread or reactors are built for power or other purposes, the radioactive waste disposal problem probably will remain a minor one in most states.

The discharge of I^{131} and P^{32} into streams used as a source of water supply is also considered. Storage in the reservoir will cause some reduction in activity, and suitable coagulation processes, settling, and filtration will account for further reductions. It is important, however, that the original concentration of the isotope be known. If, for example, a waste contained an I^{131} concentration of 1 mc./c.c., it would be necessary to obtain a removal of 99.999997 per cent to reduce the original I^{131} present to the maximum permissible concentration. If the processes used in treating the water supply will effect a 95-per cent reduction, the highest initial concentration of I^{131} that would be permissible in order to meet these requirements after treatment would be 6×10^{-4} μc/c.c. More than this would result in an effluent containing concentrations in excess of the maximum permissible value.

Three graphs; 3 tables.

Evaluation of Diagnostic Methods in Diseases of Thyroid Function, with Particular Reference to Radioiodine Tracer Tests. Bernard Roswit, J. A. Rosenkrantz, J. Sorrentino, R. Yalow, and I. Berlin. Am. J. M. Sc. **223:** 229–238, March 1952.

The correlation of the state of clinical function of the thyroid gland with the radioiodine uptake of the gland and the urinary excretion of the radioisotope was first established by Hamilton and Soley in 1939 (Am. J. Physiol. **127:** 557, 1939). Since that time a variety of technics and clinical applications have been employed.

The present study is an evaluation of two radioiodine tracer technics: the 24-hour I^{131} uptake and the 24-hour I^{131} excretion. Their diagnostic accuracy is compared with that of the initial history and physical examination, basal metabolic rate, and serum cholesterol levels. The observations were made on 141 patients, predominantly males of a veteran population. This group included, according to final diagnosis, 100 patients in the euthyroid state, 37 in the hyperthyroid state, and 4 in the hypothyroid state. Excluded from the study were patients who had received iodine-containing preparations for cholecystography, bronchography, etc., and individuals who had received any antithyroid drugs within one to three weeks before tracer studies. Final diagnoses were based on the cumulative evidence.

Geiger counters were employed to determine the activity in the thyroid and urine samples. The apparatus and geometry are fully described. The 24-hour point was chosen because at this time 90 per cent of the dose (50–100 mc.) has been removed by the thyroid and kidneys, and thus only two visits by the patient to the clinic were necessary, first to ingest the dose and twenty-four hours later for tracer studies. The technical limitations of tracer studies both in counting over the thyroid and in assaying urine samples are discussed.

On the basis of the final diagnosis, 89 per cent of the hyperthyroid patients surveyed were correctly reported in the I^{131} uptake studies. The diagnostic accuracy with excretion measurements was 94 per cent. Of 100 true euthyroid individuals, 89 per cent were reported as normal by uptake studies; 97.3 per cent were unequivocally normal by excretion standards. Of the 4 hypothyroid subjects, 1 was declared in the euthyroid range both by uptake and excretion studies.

Results for accuracy with I^{131} uptake and excretion tests were far superior to those obtained with the basal metabolic rate and serum cholesterol level determinations. Overlap between euthyroid and hyperthyroid subjects, however, appears inevitable, since the tracer tests measure only the competition of the kidneys and thyroid for circulating iodide. Further improvement in diagnostic accuracy seems to depend not on refinement of uptake and excretion methods but rather on further study of thyroid iodide clearance. Thyroid plasma I^{131} clearance rates, being independent of renal function, should reduce the overlap between euthyroidism and hyperthyroidism.

The authors assume a maximum permissible cumulative dose to the thyroid of 600 r. They calculate the delivery of about 100 er with each test dose in euthyroid, 120 er in hyperthyroid, and 35 er in hypothyroid individuals. Safe limits are apparently not exceeded.

Two charts; 2 tables. JOHN F. RIESSER, M.D.
Springfield, Ohio

A Comparison of Radioactive and Metabolic Methods of Investigating Thyroid Function. J. B. Foote, D. H. Mackenzie, and N. F. Maclagan. Lancet **1:** 486–488, March 8, 1952.

The correlation between the basal metabolic rate and radioiodine uptake, estimated by means of the thigh-neck clearance technic (Foote and Maclagan. Lancet **1:** 868, 1951. Abst. in Radiology **58:** 793, 1952), was studied in 9 normal individuals and 162 patients with various diseases of the thyroid gland.

A high degree of correlation was found between the basal metabolic rate and thigh-neck clearance in 140 untreated patients over the range of thyroid activity from myxedema to thyrotoxicosis. The results support the belief that the thigh-neck clearance method is valuable in the assessment of thyroid function, and this support is important because of the uncertainty of factors such as tissue sensitivity to hormone and relation of iodine uptake to output of hormone. In spite of this general correlation, there was considerable variation in the results of the two tests in individual cases. This variation did not seem to be related to the length of history, the size of the goiter, the degree of exophthalmos, or the age or sex of the patient.

There was a striking lack of correlation in patients receiving iodine, thyroid, or Thiouracil-type drugs. The radioiodine test gave anomalous results in patients so treated.

Two charts; 3 tables.

Studies on the In Vitro Effects of Radioactive I^{131} Labeled 3,5 Diiodo PAS on the Tubercle Bacillus. Irving Kass. Am. Rev. Tuberc. **65:** 316–324, March 1952.

The author presents the results of *in vitro* studies of

radioactive I^{131}-labeled 3,5 diiodo PAS on *M. tuberculosis*. Neither potassium iodide nor radioactive I^{131} was found to have any tuberculostatic effectiveness. PAS, 3,5 diiodo PAS, and radioactive I^{131}-labeled 3,5 diiodo PAS have relatively the same *in vitro* effectiveness against *M. tuberculosis*.

Explanations for the failure of the labeled diiodo PAS to demonstrate increased tuberculostatic activity are offered.

Radioactive I^{131}-labeled 3,5 diiodo PAS was shown to have a positive uptake in the tubercle bacillus, although I^{131} has none. The positive uptake studies suggest that radioactive I^{131}-labeled 3,5 diiodo PAS might be useful as a diagnostic aid in experimental tuberculosis.

The Relative Rates of Formation of New Leukocytes in Patients with Acute and Chronic Leukemias Measured by the Uptake of Radioactive Phosphorus in the Isolated Desoxyribosenucleic Acid. Edwin E. Osgood, Harold Tivey, Kenneth B. Davison, Arthur J. Seaman, and Jonah G. Li, with the technical assistance of Marie L. Duerst, Victor Klobucher, and Margret E. Hughes. Cancer **5**: 331–335, March 1952.

A study was made of the relative rates of new-leukocyte formation in patients with chronic granulocytic leukemias, subacute monocytic leukemias, and acute and chronic lymphocytic leukemias, as determined by the rate of incorporation of radioactive phosphorus into desoxyribosenucleic acid (DNA).

The investigation showed that the rates of new-cell formation in patients with either chronic granulocytic or subacute monocytic leukemias are adequate to produce complete labeling of the DNA phosphorus of the cell population in seven days. From this, the inference is drawn that the life span of the leukocytes in patients with these diseases is of the order of three days.

The rate of new-cell formation in patients with chronic lymphocytic leukemias is so slow that it is estimated that one hundred days would be required to renew the cell population. This implies a life span of the order of thirty days for the leukocytes of patients with chronic lymphocytic leukemias.

In contrast to the rate of P^{32} uptake by DNA in patients with chronic lymphocytic leukemia, 2 cases of acute lymphocytic leukemia showed DNA-P^{32}-uptake rates indicating complete new-cell populations in less than seven days. Thus, a biochemical method of estimating the degree of acuteness or chronicity of leukemias is available and may prove useful.

Detection of Intraocular Tumors with Radioactive Phosphorus: A Preliminary Report with Special Reference to Differentiation of the Cause of Retinal Separation. Charles I. Thomas, Jack S. Krohmer, and John P. Storaasli. Arch. Ophth. **47**: 276–286, March 1952.

The authors have found that the measurement of the uptake of radiophosphorus in tumor tissue can be applied to the diagnosis of intra-ocular tumors in cases in which the clinical ophthalmologic evidence as to the cause of retinal separation is not conclusive. To date, the test has been used in 8 cases of possible tumor and has proved fairly successful. In 2 of the cases the results of the test were negative, thus demonstrating its importance in the evaluation of the cause of retinal separation. In all of the cases studied by the authors, the lesions were situated in the anterior portion of the choroid, so that they were readily accessible for counting, but tumors situated more posteriorly can still be measured for uptake of radioactive phosphorus by rotation and fixation of the eye.

The method of localization is outlined, along with the technic of determination of radioactivity *in vivo* and *in vitro*. Radioautographs are used to illustrate photographically the concentration of radioactive material.

While the studies described must as yet be considered preliminary, they provide strongly presumptive evidence that the identification of intra-ocular tumors may be enhanced by the use of P^{32}.

Seven figures.

Contributions to the Theory and Technique of Quantitative Autoradiography with P^{32}, with Special Reference to the Granulosa Tissue of the Graafian Follicles in the Rabbit. Erik Odeblad. Acta radiol. Suppl. 93, 1952.

The author wished to study the uptake of radioactive phosphorus in the granulosa tissue of graafian follicles in the rabbit by means of quantitative autoradiography. Extensive investigations of the theoretical and technical problems involved were required, however, before the principal study could be carried out, and these preliminary studies are included in this monograph. Details of all steps in animal care, preparation and administration of radioactive phosphorus, and the handling of histologic specimens are outlined. The effect of the histologic technic on the P^{32} content of the sections was investigated, and all conceivable uncertainties in autoradiographic procedure, photometric analysis, and film development were studied so that error could be reduced to a minimum.

Evidence is presented to support the principle that the inverse-square law is valid in autoradiography, absorption being disregarded. The exposure was found to be proportional to the amount of P^{32} in any considered infinitesimal system of autoradiographic exposure. The effect of beta radiation was studied quantitatively. A constant, expressing the relation between a known amount of P^{32} and density, is calculated, thus making it possible to calculate unknown amounts of P^{32} from the measured densities, care being given to the geometrical relations during exposure.

Qualitative investigations indicated that the normal graafian follicle contains more P^{32} than the atretic one and also more than either the interstitial gland or the follicular fluid. The biological significance of the amounts of P^{32} present is not yet understood, because they are present in combination with several biochemical compounds. When this difficulty is overcome, quantitative autoradiography, along with other investigative methods, may offer some possibility of acquiring extended biological knowledge.

[This monograph contains much of value to those working in autoradiography. Interested readers are referred to the original publication.—R.F.McC.]

Fifty-three illustrations, including 4 autoradiographs; 8 tables. RICHARD F. MCCLURE, M.D.
Palos Verdes Estates, Calif.

Toxicity of Radioiodine and Radiophosphorus in Rats in Doses Comparable to Those Used Clinically. Campbell Moses, Joseph B. Boatman, Robert S. George, and Agatha M. DeLacio. Proc. Soc. Exper. Biol. & Med. **79**: 343–344, March 1952.

Radioactive phosphorus, P^{32}, was administered by

intubation to three groups of young male rats in doses equivalent to 4.6 mc., 7.0 mc., and 11.6 mc. for a 70-kg. man. Doses of radioiodine, I^{131}, equivalent to 14.0 mc., 42 mc., and 420 mc. were given to three similar groups of rats. All animals were sacrificed six weeks after the administration of the isotopes. Except for a significant decrease in the testes/body weight ratio and a moderate lymphopenia at the time of necropsy, no growth curve, organ weight, or histologic evidence of damage was discerned in the animals receiving P^{32}. Although no changes in weight gain or histologic evidence of organ damage was observed in the animals given I^{131}, some variations in organ weight/body weight ratio were recorded. In the doses employed in this investigation, which were comparable to those used clinically, no evidence of serious radiation damage was encountered.

One table.

Physical Characteristics of Radiation in Cobalt^{60} Beam Therapy. H. E. Johns. J. Canad. A. Radiologists **3**: 2–6, March 1952.

The apparatus, including the treatment head, cones, and room protection, for application of cobalt^{60} beam therapy as used at the University Hospital, Saskatoon, is described. The source, its method of production, and problems of handling and placing it in the unit are discussed.

The radiation from cobalt^{60} consists of two gamma-ray lines of energy of 1.17 and 1.33 mev. A beta ray of 0.3 mev is also emitted but is mainly absorbed in the source itself. This radiation gives about the same depth dose as is obtained from a 3-mev x-ray machine.

The advantages and disadvantages of cobalt^{60} beam therapy are presented. Cobalt units simple to operate should require little if any service, though they suffer from the disadvantage of requiring a new source periodically. The present unit has an output of 33 r per minute at 80 cm. This is considerably smaller than that obtainable from 2-, 3- and 4-mev x-ray generators. However, sources of Co^{60} two to three times as strong as the present one could easily be made and handled. The cobalt unit is flexible in operation and can readily be arranged for accurate beam radiation. Depth-dose data, as well as an isodose curve and comparative distribution charts for comparable fields from this apparatus and from 400-kv. x-radiation, are recorded.

Seven illustrations; 1 table.

THOMAS H. WOLEVER, M.D.
The Henry Ford Hospital

Clinical Possibilities of the Cobalt^{60} Beam Unit. T. A. Watson. J. Canad. A. Radiologists **3**: 7–10, March 1952.

In general it is considered that deep lesions suitable for small or medium-sized fields should be chosen for cobalt^{60} therapy. The Saskatchewan unit is being used chiefly for lesions which previously would have received 400-kv. therapy, as cancers of the esophagus, larynx, pharynx, and possibly the lung. It is also used for irradiation of the parametria following radium therapy for cervical cancer and for postoperative irradiation of the axilla and supraclavicular regions in cancer of the breast.

The methods of applying cobalt^{60} beam therapy to a patient are described, that of horizontal rotation therapy in detail. For treatment of a tumor of the lung, for example, the lesion is localized by x-ray films, and determinations are made of the desired tumor dose and the daily surface dose necessary to attain this. The patient lies supine on the treatment couch, which is wheeled onto a rotating platform and adjusted so that the center of the tumor (marked on the chest) is in the axis of rotation of the platform. A Manchester pin and arc attached to the therapy unit are used for beam direction, and a ceiling spot light centered upon the mark on the chest makes it possible to see that the patient does not change position. The daily exposure having been previously determined, the speed of rotation is pre-set so that the platform will revolve exactly twice during the exposure. The focal skin distance is 85 cm.

The advantages and disadvantages of this type of therapy compared to 2-mev x-ray irradiation are set forth. Comparative isodose and dosage distribution charts are presented.

Ten illustrations.

THOMAS H. WOLEVER, M.D.
The Henry Ford Hospital

Room Protection Measurements for Cobalt^{60} Teletherapy Units. W. R. Dixon, C. Garrett, and A. Morrison. J. Canad. A. Radiologists **3**: 11–15, March 1952.

Since the direct beam from a cobalt^{60} teletherapy unit is usually limited to travel in a vertical plane, the major part of the protection design is concerned with the scattered radiation which is in the range of 200 to 1,200 kv., depending upon the angle of scatter.

From experimental measurements the authors have prepared graphs to show the percentage transmission of the broad-beam radiation from a cobalt^{60} unit with an output of 22 r/min. at one meter, through both lead and concrete. Measurements were also made of the intensity distribution of scatter from a phantom. Sample calculations are given so that from the results obtained in these measurements, protection for other cobalt^{60} teletherapy units can be obtained.

In most cases the intensity of back-scatter from the front wall or floor is much less than the intensity from the patient, and in many cases may be neglected altogether, since the wall thickness required varies essentially as the logarithm of the intensity. If the back-scatter from the wall or floor must be considered, it may be assumed that the intensity of the direct beam is reduced to approximately 40 per cent due to absorption in the patient. The contribution from the wall may then be added to the contribution from the patient, and the required protection thickness calculated as if the total intensity originated in the patient. Since the contribution from the wall or floor is, on the whole, of a lower energy than the contribution from the patient, this procedure may result in slightly overestimating the thickness required.

Seven graphs; 1 sketch.

THOMAS H. WOLEVER, M.D.
The Henry Ford Hospital

Cobalt^{60} Beam Therapy: Some Influences and Advantages. Ivan H. Smith. J. Canad. A. Radiologists. **3**: 16–19, March 1952.

The London, Ontario, cobalt^{60} beam therapy unit has been in operation since Oct. 27, 1951, and 51 cases have been treated. Some initial impressions are: (1) that cobalt therapy will not replace conventional irradiation; (2) that it will expand the effectiveness of

radiotherapy; (3) that it demands a radiation physicist; (4) that it places added emphasis on centralization of radiotherapy; (5) that it will place us closer to "state medicine"; (6) that cobalt^{60} or its equivalent will be a "must" for any department handling 500 new therapy cases a year; (7) that it permits utilization of rotation therapy to its fullest advantage. [It is to be hoped that No. 5 is an "impression" only.—T.H.W.]

The author presents a case of recurrent angioendothelioma of the right nasopharynx which was treated with the cobalt^{60} beam. With the aid of sketches he compares the skin dose, tumor dose, and volume dose in cobalt^{60} beam therapy and 250-kv. x-radiation. A striking decrease in volume dose was observed with cobalt^{60}.

Six drawings; 3 photographs.

THOMAS H. WOLEVER, M.D.
The Henry Ford Hospital

Considerations in the Design of a Cobalt^{60} Beam Therapy Equipment. D. T. Green and R. F. Errington. J. Canad. A. Radiologists **3**: 20–24, March 1952.

The design and structural features of a cobalt^{60} beam therapy unit for delivering up to 60 r per minute at a distance of 1 meter are described. This unit is of the type that uses mercury and air pressure to "turn the beam on and off." A system of source handling, shipping, and loading, as well as a suitable treatment head which provides maneuverability and support and beam definition and direction are presented.

Three drawings; 1 photograph.

THOMAS H. WOLEVER, M.D.
The Henry Ford Hospital

Endovesical Irradiation of Tumors of the Bladder with Radioactive Cobalt. W. Bessler and Th. Meister. Schweiz. med. Wchnschr. **81**: 1214–1218, Dec. 8, 1951. (In German)

This report on the treatment of malignant tumors of the bladder with radioactive cobalt in liquid form is necessarily a preliminary one, since not more than ten months have elapsed since the first patient was treated. The authors are, however, much impressed with their results.

A Bardex type catheter, double-barreled, with a collapsible balloon near the tip, is introduced into the bladder. One of the lumina goes to the balloon, the other leads through the tip directly into the bladder. Thus the urine can be constantly drained away and the bladder wall will retain close contact with the balloon, which is filled with the radioactive solution. If the tumor is located close to the internal orifice of the urethra, it might be advantageous to clamp off the catheter during the treatment, thus allowing partial filling of the bladder. This will remove the dome of the bladder from the irradiating substance and allow a larger dose to the tumor itself. The urine can be drained off from time to time.

The authors employ a water-soluble chloride compound of cobalt^{60} ($CoCl_3$), which produces a rather hard gamma radiation and only a weak beta radiation, most of the latter being absorbed by the rubber balloon. One millicurie of the isotope will yield 13 gamma roentgens per hour at a distance of 1.0 cm. The authors use 18 to 25 mc. in about 60 c.c. of water, which will produce along the surface of the balloon between 800 and 1,300 r. Treatment is continued for seven to ten days for a total dosage of 10,000 to 12,000 r. Since the half-life of Co^{60} is 5.3 years, the solution can be used repeatedly, but careful measurements must be made before each application.

The intensity of the irradiation diminishes rapidly with the distance. Therefore, deep infiltrating tumors are not suitable for this treatment. It is indicated in diffuse benign papillomatosis, recurrent localized papillomatosis, malignant papillomas, and superficial carcinomas of the bladder, and for postoperative irradiation after incomplete extirpation of the tumor.

The authors report 16 cases treated by Co^{60}. There were 3 deaths due, respectively, to generalized metastases, to an ascending pyelonephritis, and to a perforation of the cancer into the abdominal cavity, with peritonitis. The other 13 patients remained free from recurrences, though, as pointed out above, the post-treatment interval was brief. One required a second treatment after a recurrence but remained cancer-free thereafter.

Complications varied. Most of the patients had considerable tenesmus during the irradiation, but after the removal of the catheter this symptom disappeared fairly rapidly. A cystitis developed almost regularly, usually lasting about one month, though in some cases it persisted much longer. It reached its peak several days after the removal of the catheter and was for the most part resistant to antibiotic medication. Sometimes it was hemorrhagic. The capacity of the bladder was not usually much changed. Only in the one patient who had two irradiations did contraction occur, with a decrease in capacity to 40 c.c. after eight months. Sometimes a proctitis developed, with marked reddening of the mucous membrane and some secretion of mucus. One patient had a fairly severe periurethritis. This occurrence may be avoided by introducing a few cubic centimeters of air into the catheter after the injection of the radiopaque material.

Various precautionary measures should be observed. Measurements have shown that, in order to avoid excessive irradiation of others, the patient should preferably be in a single room, or at a distance of at least 2.5 meters from other patients. A nurse should not stay more than one hour a day at the bedside of the patient. Dressings and cotton as well as laundry that may have been contaminated with the liquid cobalt should be separately and carefully disposed of, preferably buried.

Two roentgenograms; 1 photograph; 3 tables.

WM. A. MARSHALL, M.D.
Chicago, Ill.

Effect of Colloidal Au^{198} on the Growth Cycle of Leukemic Cells and on the Survival of Their Host. Horace Goldie, F. B. Watkins, Carl Powell, and Paul F. Hahn. Cancer Research **12**: 92–99, February 1952.

The authors state that the investigation described in their paper represents only a first attempt to apply the analysis of the growth cycle of leukemic cells to the assay of anti-leukemic agents. Leukemic spleen cells were inoculated intraperitoneally into Akm mice. Blood and, in several series, peritoneal fluid were withdrawn from these animals repeatedly, at various intervals.

It was found that the intravenous injection of colloidal Au^{198} (0.3–0.5 mc.) invariably prolonged the life span of leukemic mice. This effect was inversely

proportional to the number of inoculated cells and to the interval between inoculation and treatment and was directly proportional to the dose of Au^{198}. Thus, the effect depended on the ratio "amount of radioactivity per leukemic cell in a unit of time," and it was due to the direct effect of radioactivity on the agent of the leukemic condition, *i.e.*, the leukemic cells. Treatment with Au^{198} was also found to reduce the number of leukemic cells in the blood and the organs (slightly in the fluid). It is concluded that the therapeutic effect of this agent is due (*a*) to its direct cytotoxic action on the leukemic cell, (*b*) to improvement of the regulating mechanism of the host, and (*c*) to stimulation of reticulo-endothelial elements.

Treatment with repeated small doses of aminopterin drastically reduced the cellular content of the blood and the peritoneal fluid but allowed the replacement of destroyed leukocytes by production of the hematopoietic organs and therefore extended the survival of mice.

Combined treatment with Au^{198} and aminopterin demonstrated a synergistic cytotoxic effect on leukemic cells. Moreover, the mice survived longer than mice treated with aminopterin alone. This is attributable to the compensation of the anti-anabolic effect of aminopterin by stimulation of the reticulo-endothelial elements with colloidal gold.

Two charts; 6 tables.

The Cardiac Complications of Hemochromatosis. Report of a Case Including Radioiron Studies and a Note on Etiology. T. H. Bothwell, B. van Lingen, T. Alper, and M. L. du Preez. Am. Heart J. **43**: 333–340, March 1952.

A case of hemochromatosis in a young adult woman is presented, the salient findings being heart failure, skin pigmentation, amenorrhea, and enlargement of the liver. Only 2 similar cases in women have been reported.

Radioiron absorption studies showed that 75 per cent of a total oral dose of 20 mg. of ferrous sulfate was retained in the body. The level of radioiron in the blood reached a maximum of 3.5 per cent of the administered dose after a period of thirty days, and *in vivo* counts showed a large deposition of radioiron in the liver. Counts over the heart seemed to indicate a real deposition in the heart muscle.

The authors suggest that heart failure in hemochromatosis is related more to the rate at which iron is laid down in the cardiac muscle than to the absolute quantity deposited.

Two electrocardiograms; 2 graphs; 1 photomicrograph.

Clearance of Radiosodium from the Subcutaneous Interstitial Fluid of the Limb. D. M. Douglas, J. A. Campbell, M. McInally, and D. J. Robertson. Brit. J. Urol. **24**: 54–55, March 1952.

In normal young adults in vasodilatation the clearance rate of radiosodium from the interstitial fluid of the leg was found to be relatively constant, at a rate of about 5 per cent per minute. The clearance depends chiefly on the amount of blood flowing through the part, but since the question of capillary permeability is involved, it cannot reasonably be used as a measure of blood supply. The rate of clearance, however, should prove to be a valuable index of the absorption of interstitial fluid from the subcutaneous tissues.

The Possible Use of Neutron-Capturing Isotopes Such as $Boron^{10}$ in the Treatment of Neoplasms. I. Intracranial Tumors. William H. Sweet and Manucher Javid. J. Neurosurg. **9**: 200–209, March 1952.

Certain isotopes, such as $Boron^{10}$, have a special tendency to capture slow (thermal) neutrons, whereas the atoms normally present in living tissues do not do so. Since B^{10} at capture yields an alpha particle of high energy which travels only about 14 μ in tissue, the site of the atom of B^{10} determines the site of destruction of tissue following this capture reaction. Chemical analyses in 58 cases after intravenous injection of borax show that this compound concentrates in many rapidly growing brain tumors to more than three times the extent that it does in normal brain. This differential is maintained for only the first twenty to thirty minutes after injection in most instances. The total amount of boron that may be introduced without toxic effects yields concentrations in tumor > 50 μg./gm. and in brain > 15 μg./gm. of tissue—sufficient, according to the authors' computations, to cause, despite other capture reactions, energy in tumor three times that in normal tissue. A procedure for utilizing these effects to treat brain tumors in man is described.

Five charts.

RADIATION EFFECTS

Effect of Irradiation on the Universal Reaction in Cancer. Reuben L. Kahn, Fred J. Hodges, Isadore Lampe, and Owen W. Doyle. Cancer Research **12**: 170–175, March 1952.

The "universal reaction" is a serologic precipitation reaction to lipids based on different NaCl concentrations and different periods of incubation. It is believed to be an immunologic indicator of tissue breakdown. If this is true, the reaction should show changes resulting from the tissue injury incident to irradiation.

The universal technic employed in the investigation consists of seven quantitative set-ups. The technical steps of each set-up are similar to those employed in the performance of a quantitative Kahn test, with the exception of the use of different NaCl concentrations and incubation periods. The general plan of the study was to obtain blood specimens for universal reactions from cancer patients when they reported for irradiation and again two or three months after the radiotherapy. The laboratory staff had no knowledge of the clinical status of the patient.

Patients whose universal reactions showed a rise in precipitation following irradiation were found to manifest clinically a normal post-irradiation course, while those whose universal reactions showed no rise or a decline in precipitation were in a poor state clinically and did not manifest a normal post-irradiation course. Only by means of extensive and prolonged studies, with repetition of the universal reaction every few months, will it be possible to determine the extent to which it may serve as an aid to the clinician in interpreting the results of irradiation therapy in cancer.

Effect of Irradiation on the Universal Reaction in Polycythemia Vera. Reuben L. Kahn, William H. Bullock, and Frank H. Bethell. Cancer Research **12**: 176–179, March 1952.

For a definition of the "universal reaction" and a brief description of the technic, the reader is referred to the preceding abstract. The present article concerns the universal reaction in patients with polycythemia before and after irradiation.

Blood specimens were obtained from patients with polycythemia at the time they reported for treatment with radioactive phosphorus (P^{32}). A second specimen was obtained when the patients returned for a check-up, generally one to four months later. As in the previous study, the specimens were submitted to the laboratory as "unknowns." After the specimens were examined, the results were correlated with the clinical findings.

In the patients in whom the universal reaction showed a rise in precipitation following irradiation, the polycythemia was found to be under control. In the patients in whom the universal reaction showed no rise in precipitation following irradiation, the polycythemia was found to be in an active state and not under control.

It is possible that the lack of increase in precipitation in the universal reaction of the irradiated patients, when the polycythemia is not controlled, is associated with red cell production, which may in some way interfere with antibody formation.

Two charts.

Sarcoma of the Skin Following Roentgen Irradiation. F. von Moos. Schweiz. med. Wchnschr. **82**: 179–182, Feb. 16, 1952. (In German)

Malignant tumors caused by roentgen rays fall in the group of so-called "irritation tumors" because their growth is subject to extrinsic factors. Roentgen irradiation given over a prolonged period is "cell-noxious." Why only certain cases show malignant degeneration is not known.

X-rays produce tissue defects such as atrophy, telangiectasis, and disturbances of pigmentation. After such damage the tissue may show regenerative growth, with subsequent development of carcinoma. The regeneration without exception plays the most important role in tumor formation.

Tumors due to roentgen irradiation are characterized by slow development and a relatively slight tendency to metastasis. They are well circumscribed and show rapid ulceration. The interval between irradiation and the development of carcinoma varies from two to twenty-eight years according to the literature.

The author observed a 65-year-old woman who received radiation therapy to the chin in 1917 because of hypertrichosis. For the following fifteen years the patient was symptomless, though her skin was deeply pigmented. In 1932 small ulcers developed in the irradiated skin but biopsy showed no malignant change. In July 1946, twenty-nine years after the original treatment, a few hard nodes were treated conservatively. Biopsy six months later led to a diagnosis of spindle-cell sarcoma. The skin was locally atrophic and pigmented. That beneath the chin and left mandible was swollen and infiltrated. On the mandible itself was a small ulcer and beneath the chin was a tumor 7 or 8 cm. in diameter. Six months later this tumor was excised. In December 1947 the patient was again seen with a tumor in the region of the right mandible. It was removed by the electric knife but recurred. Contact therapy was tried, but without effect. Death occurred in July 1949. Autopsy showed spindle-cell sarcoma of the right mandible, with invasion of the upper pole of the thyroid, perforation of the larynx, complete infiltration of the floor of the mouth and of the lateral and medial muscles of the neck, small metastatic nodules in the lungs, anemia, and cachexia.

The author concludes that tissues subjected to irradiation and subsequent chronic irritation are more prone to the development of cancer than those without previous irradiation. Biopsy in early cases where no sarcoma can be recognized shows an increase of connective tissue.

Two photomicrographs; 1 photograph.

ILONA D. SCOTT, M.D.
VA Hospital, Chamblee, Ga.

Carcinomatous Metastases in the Skin Histologically Suspicious of Tuberculosis. H. Vernár and A. Šári. Acta radiol. et cancerol. bohemoslovenica **5**: 167–179, 1952. (In English)

The authors describe post-irradiation changes in the skin histologically resembling tuberculosis, observed in several cases. On more adequate study these proved to be carcinomatous.

Two photomicrographs.

Vesicovaginal Fistulas. Bayard Carter, Leonard Palumbo, Robert N. Creadick, and Robert A. Ross. Am. J. Obst. & Gynec. **63**: 479–491, March 1952.

The authors report on a series of 73 consecutive cases in which operation was done for various types of urinary fistula. There were 57 (78.1 per cent) vesicovaginal, 8 (11 per cent) urethrovesicovaginal, 3 (4.1 per cent) urethrovaginal, and 5 (6.8 per cent) vesicocervicovaginal fistulae.

Nine fistulae were produced by irradiation therapy alone, and 8 of these occurred in women with cancer of the cervix: 7 of this latter number were vesicovaginal, with 1 operative failure, whereas 1 was a vesicocervicovaginal fistula, in which there was operative failure. The other vesicovaginal fistula in this group of 9 occurred in a woman with severe diabetes mellitus, developing seven months after radium therapy for excessive bleeding from a myomatous uterus. Operation in this case also was unsuccessful.

In 3 cases of vesicovaginal fistula following treatment of cancer of the cervix by irradiation with subsequent abdominal hysterectomy, there were 2 failures. One of these patients had severe diabetes mellitus.

The authors believe that, although the duration of the fistulae and the preoperative and postoperative care are of great importance, the nature of the responsible injury, the type of fistula, and its location are the main factors in determining the results of attempted repair. Fistulae which occur after irradiation with or without hysterectomy contribute the highest rate of failures.

JOHN M. KOHL, M.D.
Jefferson Medical College

Hysterographically Visualized Radionecrosis Following Intra-Uterine Radiation of Cancer of the Corpus of the Uterus. Olof Norman. Acta radiol. **37**: 96–102, February 1952.

The follow-up study here reported confirms a prior hypothesis (Acta radiol., Supp. **79**, 1950. Abst. in

Radiology **56**: 622, 1951) that changes seen on hysterography after radium therapy of cancer of the uterine corpus represent radionecrosis. This hypothesis was based on the following observations:

1. Changes appeared some weeks after radium therapy.
2. They occurred despite therapy and were therefore probably not ascribable to progression of the cancer.
3. The changes always appeared at sites in which there were no pathological signs in hysterograms taken before irradiation.
4. Follow-up hysterography showed gradual diminution and disappearance without treatment.

In 3 cases subsequently coming to operation the diagnosis of radionecrosis was proved pathologically. The frequency of radionecrosis was assessed on the basis of 115 cases. Thirty-five cases showed suggestive changes. In 8 of 45 cases with no signs of cancer in the upper part of the uterus, radionecrosis was seen in that area. In 23 of 92 cases it occurred in a lateral wall of the uterus uninvolved by cancer, and in 28 of 86 cases it occurred at the level of the cancer-free internal os.

The relative higher frequency of occurrence at the internal os level is attributed to distention of the mucosa as a result of dilatation of the cervical canal and packing with radium capsules.

Seven roentgenograms; 2 diagrams; 2 tables.

JOSEPH P. TOMSULA, M.D.
Baton Rouge, La.

Fractures of Neck of Femur Following Irradiation of the Pelvis. R. C. S. Pointon and T. B. Smith. Proc. Roy. Soc. Med. **45**: 135–139, March 1952.

The authors report 4 cases of subcapital fractures of the femur which occurred following pelvic irradiation for carcinoma of the cervix. These were found in a group of several hundred cases similarly treated prior to 1947. Three insertions of intracavitary radium (Stockholm technic) were made, after which external irradiation was administered as follows: two anterior and two posterior oblique fields, all directed medially, plus two lateral fields, each 20 × 10 cm.; 220 kv.; h.v.l. 2.35 mm. Cu; focal-skin distance 50 cm. One field was treated daily to a total of 2,500 r to each field in six weeks. The amount of energy absorbed by the femoral neck was not calculated, owing to the difference in the absorbing capacity compared with the adjacent soft tissues.

After an interval ranging from three to fourteen months, the patients first complained of vague pain in the affected hip and on that side of the pelvis. Roentgenograms at this time were reported as negative. Seventeen to thirty-seven months following the completion of irradiation, obvious fractures of the femoral neck were easily recognizable. One patient submitted to operation, and the surgically resected specimen showed no evidence of metastasis. The fracture line was filled with a mass of fibrous tissue. There was a complete absence of bone reaction to the fracture, and the whole specimen was very avascular.

Since 1947 smaller fields are used in irradiating the pelvis in carcinoma of the cervix, and lateral fields, which were believed to be responsible for most of radiation to the femoral neck, have been abandoned. No case of fracture of the femoral neck has appeared since the adoption of this method.

Seven roentgenograms. D. D. ROSENFELD, M.D.
Fontana, Calif.

Reconstruction of Injuries Following Excessive Radiation Therapy. Paul W. Greeley. Am. J. Surg. **83**: 342–346, March 1952.

This paper is primarily of surgical interest. It describes the typical changes produced by excessive irradiation and stresses the necessity of adequate excision of the damaged tissue back into an area of good blood supply. Closure of the resulting defect may be effected by one of several plastic procedures.

Six figures.

Body Weight, Fasting and Forced Feeding After Whole Body X-Irradiation. Willie W. Smith, Isabelle B. Ackermann, and Falconer Smith. Am. J. Physiol. **168**: 382–390, Feb. 1, 1952.

Lesions of the alimentary tract are thought by some investigators to cause the early death which occurs after relatively large doses of radiation. Damage to the intestinal mucosa has also been observed within a few hours after lower radiation doses, but a nearly normal histologic appearance is reported to be restored in dogs, rats, and mice after three or four days, even though most of the animals subsequently die. Changes in body weight during these few days are probably dependent to a great extent upon the physiological condition of the gastrointestinal tract. The experiments reported here show comparative studies of weight changes in rats, mice, and guinea-pigs, effects of fasting and forced feeding, and emptying time of the alimentary tract during the first few days following irradiation.

Rats were irradiated 12 at a time and guinea-pigs 6 at a time, from the dorsal aspect, in a presdwood box, the bottom of which was 75 cm. from the target of the tube. Mice were irradiated, 10 at a time, at a distance of 50 cm. Radiation factors were 200 kv.p., 20 ma., 0.25 mm. Cu and 0.51 mm. Al added filtration except in one experiment where the aluminum used was 0.78 mm. thick.

The weight pattern in these animals following whole-body irradiation was a stronger characteristic of species than of dose or lethality. After doses which resulted in the same percentage of deaths in rats (750 r), mice (600 r), and guinea-pigs (350 r)—lethal to about 80 per cent in twenty-eight days—the rate of weight loss was very high in rats and moderate in mice, while guinea-pigs continued to gain weight. Fasting did not significantly alter mortality. Forced feeding of a partially predigested diet by stomach tube was detrimental to rats when the feedings were given during the first three days following irradiation, but was not damaging when given after the fourth day. Stasis of the alimentary contents of the rat was observed after irradiation, principally in the stomach.

Seven illustrations.

Role of the Adrenal in the General Resistance of the Organism to Radiations. H. Betz. J. belge radiol. **35**: 380–392, 1952. (In French)

Herve and Bacq (Compt. rend. Soc. biol. **143**: 881, 1949) have shown that the injection of KCN immediately before irradiation protects mice against an LD-100 dose of x-rays. Histologic study by the present author

showed no difference in the intensity of the lesions produced by irradiation in animals injected with KCN and uninjected controls. In irradiated mice there was a diminution in adrenal cortical lipids and an increase in hepatic lipids. These phenomena, which enter into the formation of the alarm syndrome, are both strongly inhibited by the preliminary injection of KCN. The death of the animals is then attributed rather to generalized disturbance related to the adaptation syndrome than to irradiation-produced tissue lesions.

It is possible to create in irradiated mice a state of specific resistance to x-rays, for animals irradiated with sublethal doses are, in a certain measure, protected against later lethal irradiation. One may also create a non-specific state of resistance, though less efficacious, by submitting the animals to another "stress" besides the x-rays (cold) or by repeated injections of ACTH before irradiation. On the contrary, if administered after irradiation, ACTH aggravates the adrenal depletion, and hastens the death of the irradiated mice.

Seven graphs. CHARLES M. NICE, M.D.
University of Minnesota

Survival of Rats Adrenalectomized After X-Irradiation. Abraham Edelmann and Seymour Katsh. Am. J. Physiol. **168**: 626–627, March 1, 1952.

Rats were adrenalectomized at various times after exposure to 650 r of whole-body irradiation (160 kv.p.; 30 ma.; 1 mm. Al; half-value layer 0.13 mm. Cu; 100 r per minute). It was found that, for periods up to five days, the shorter the interval between exposure and adrenalectomy, the shorter the survival. If the operation was performed after this time, no appreciable reduction in the life span was observed. It is believed that these data indicate that as a result of irradiation there is an increase in demand for adrenal hormones which is greatest during or immediately after exposure and is reduced in from three to five days.

The method employed in these experiments, *i.e.*, adrenalectomy after exposure to stimuli and observation of survival time, appears applicable to other studies of adrenal-cortical function. The authors suggest that its use may obviate the need of adrenal extracts in those experiments involving adrenalectomy, subsequent stimulus, and then replacement therapy.

Protective Effect of Pitressin and of Epinephrine Against Total Body X-Irradiation. John L. Gray, Elizabeth J. Moulden, John T. Tew, and H. Jensen. Proc. Soc. Exper. Biol. & Med. **79**: 384–387, March 1952.

A study was made of the effect of pitressin and of epinephrine on the survival rate after total-body irradiation. Rats, weighing 220–300 gm., were irradiated in pairs, one animal serving as a control. Radiation factors were: 200 kv., 6 ma., 0.5 mm. Cu and 1 mm. Al filtration, target distance approximately 20 cm., 40 r per minute (in air) for twenty-two minutes. Five units (0.25 ml.) of pitressin or 0.2 mg. (0.2 ml.) of epinephrine were injected intraperitoneally either five, twenty, or forty minutes before or five minutes after exposure. Animals were weighed daily until death or termination of the experiment after twenty-eight days.

As would be expected with an 880 r dose in total-body exposure, the majority of deaths occurred between six and fourteen days. Pitressin given five minutes before irradiation afforded considerable protection, with a survival rate of 86 per cent as compared with 12 per cent survival for the untreated irradiated group. Similarly, pitressin injected twenty minutes before exposure decreased the mortality significantly. With injection forty minutes prior to irradiation, the protection was diminished but still definite. The beneficial effect of pitressin pretreatment was further indicated by the observation that the surviving pitressin-treated irradiated animals lost less weight and recovered weight very rapidly compared with irradiated controls. Epinephrine administered five minutes before irradiation also seemed to give protection, but apparently not to the same degree as pitressin. Pitressin given five minutes after irradiation seemed to bestow only very slight, if any, protection. Threshold studies employing greater x-ray dosages indicate that with pitressin injection five minutes before irradiation the threshold could be raised from about 800 r to about 1,100 r.

Four tables.

Presence and Identity of Vasotropic Substances in Blood of Rats Subjected to Acute Whole Body Roentgen Ray Irradiation. Thomas J. Haley, Richard F. Riley, Idamae Williams, and Margaret R. Andem. Am. J. Physiol. **168**: 628–636, March 1, 1952.

A systematic study was made of the effect of 600 r acute whole-body and regional irradiation on the peripheral vascular system of the rat. The physical factors were: 250 kv.p.; 15 ma.; target-skin distance 100 cm.; filters 0.21 mm. Cu inherent, 0.5 mm. Cu parabolic and 1.0 mm. Al; half-value layer 1.85 cm. Cu; 9.6 to 9.66 r per minute (in air). The effects of such radiation upon the formed elements of the blood, the intestinal tract, and other body tissues were correlated with the published data concerning radiation damage of these tissues. It was demonstrated that the peripheral vascular function is not impaired by a direct action of the radiation on the precapillary sphincters and terminal arterioles but is mediated through the release of a vasodepressant material (VDM) by the liver. This material, which is present in the circulation during the first post-irradiation week, has been shown to be the same as that which appears in the blood of animals in irreversible shock. It fits all of the criteria for ferritin. The sequence of its appearance, however, is different from that reported for physiological shock states.

A vasoexcitor material (VEM) was found in the blood of irradiated animals during the second post-irradiation week, and this material fits the criteria established for the VEM found in the blood of animals in the reversible phase of shock.

Two charts; 1 table.

Mortality of Mice After Total-Body Irradiation as Influenced by Alterations in Total Dose, Fractionation, and Periodicity of Treatment. Henry S. Kaplan and Mary B. Brown. J. Nat. Cancer Inst. **12**: 765–775, February 1952.

This is essentially a statistical treatment of the data obtained in an experimental study of the effect of alterations in total dose, fractionation, and periodicity of total-body irradiation on the development of lymphoid tumors in mice. A detailed mathematical model is prepared for daily fractionation to provide a tentative framework for additional dose-response experiments.

Six charts; 5 tables. D. S. CHILDS, JR., M.D.
Rochester, Minn.

Local Hemostasis in the Hemorrhagic Syndrome of Irradiation. Robert Bourdeau and Harold Laufman. Arch. Surg. **64:** 154–158, February 1952.

Among 16 dogs exposed to whole-body irradiation of 350 to 400 r, hemorrhagic syndrome developed in only 10. Of this number, 6 were operated upon, and segments of the spleens were excised. In all, the bleeding of spleen and wound were controlled by gelatin sponges, although there was some seepage in one. The work offers hope for the control of bleeding in post-irradiation hemorrhagic conditions. The mechanism of the bleeding syndrome, however, is not solved.

ALLIE WOOLFOLK, M.D.
Pittsburgh, Penna.

Neoplasia Induced in Rat Embryos by Roentgen Irradiation. James G. Wilson, Robert L. Brent, and H. Charles Jordan. Cancer Research **12:** 222–228, March 1952.

During the course of studies on the over-all effects of irradiation on embryonic development, it was observed that discrete tumor-like growths developed in and around the brain of rats exposed to x-rays on the ninth day of gestation. Although all were probably of neural origin, many of these growths retained no connection with the brain. This communication describes the method of production, the incidence, and the growth characteristics of such independent tumors in embryonic and newborn rats.

The method whereby selected rat embryos can be irradiated without exposing the mother or the remaining embryos was described in an earlier paper (Am. J. Anat. **88:** 1–33, 1951. Abst. in Radiology **59:** 634, 1952). In the present investigation 25, 50, 100 or 200 r (in air) were given at a single exposure to the unshielded embryos.

The incidence of the tumor-like growths in the head region was directly related to the dosage of x-ray. They first appeared on the second day after irradiation and thereafter exhibited varying capacities for growth and differentiation. Some grew for one or two days, then disappeared as a result of dispersal of the cells; others grew rapidly until the fifth or sixth post-irradiation day, then became atrophic; still others continued to grow slowly until the seventh or eighth day, then became static or underwent atrophic regression. Few remained in newborn animals, and these were small and gave no evidence of proliferative activity. Although the tumor-bearing animals had a somewhat higher mortality than the non-irradiated controls, neither prenatal or postnatal death could be attributed to the presence of the tumors.

Thirty-one illustrations.

Further Studies on Metastasis of a Transplantable Mouse Mammary Carcinoma After Roentgen Irradiation. Carl F. von Essen and Henry S. Kaplan. J. Nat. Cancer Inst. **12:** 883–892, February 1952.

Kaplan and Murphy have demonstrated a significant increase in the rate of pulmonary metastasis following local irradiation of a certain mouse mammary carcinoma. In the earlier experiments, the tumor was irradiated locally at the site of implantation on one hind leg. In the present experiment, the control procedure of locally irradiating the hind leg not containing the tumor was done to learn whether local irradiation of the host alone during the phase of active tumor growth would also enhance metastasis. No increased incidence of metastasis was found when the host was locally irradiated in a non-tumor-bearing area.

A second experiment was performed, using metastatic nodules as implantation fragments. No evidence of increased pulmonary metastasis was noted, suggesting that there was no permanent alteration in the tumor *per se* from irradiation.

A third experiment revealed that irradiation of the host alone or of the tumor alone does not increase metastatic activity in the host. Finally, a suspension of viable cells of tumor was injected intravenously into the mice, producing metastatic lesions in the lungs.

The authors conclude that the effect of irradiation on metastasis of the tumor used in these studies (Bagg-Jacksen mouse mammary carcinoma 755) involves a transient local disturbance of the host-tumor relationship, probably concerned with facilitating entry of tumor cells into the blood vessels.

Four tables.

D. S. CHILDS, JR., M.D.
Rochester, Minn.

Factors Modifying the Effect of X-Irradiation on Regression of a Transplanted Lymphosarcoma. Joanne Weikel Hollcroft, Egon Lorenz, and Marion Matthews. J. Nat. Cancer Inst. **12:** 751–763, February 1952.

The authors reported previously the pronounced regression of a transplanted mouse lymphosarcoma caused by synergistic action of simultaneous body and tumor x-irradiation (J. Nat. Cancer Inst. **11:** 1, 1950. Abst. in Radiology **57:** 302, 1951). The present paper discusses different factors modifying irradiation effects on the tumor.

Strain A male mice were inoculated subcutaneously with a transplantable lymphosarcoma of known history. Irradiation was administered ten days following the transplantation, either 400 or 1,300 r being used, with differing dose rates. When only the tumors were irradiated, each animal was placed in a lead shield 5 mm. thick, containing a slot through which the tumor was exteriorized. The dose to the body in such a case was found to be less than 0.5 per cent of the tumor dose. When the tumors were shielded, the dose to the tumor was found to be 1 per cent of the total-body dose. The size of the tumors was determined with calipers.

Some of the mice were given 400 r of whole-body irradiation. In half of this group the body was shielded and the tumor was irradiated locally at varying time intervals; the tumor was then shielded and the body irradiated. In the remaining animals the bodies were irradiated before the tumors. Numerous experiments were performed to determine the effect on tumor regression of (1) irradiation of the tumor alone followed by general body irradiation at varying intervals; (2) body irradiation preceding tumor irradiation; (3) whole-body irradiation during which the blood supply to the tumor was cut off. It was found that, when the tumor and the body are irradiated at different times, the effectiveness of the treatment decreases as the interval between irradiation increases. Whether the body or the tumor is treated first did not seem to be important. When the blood supply to the tumor was clamped off during total-body irradiation, tumor regression was negligible. The authors interpret this as showing that the primary effect of irradiation is instantaneous, and the presence in the tumor of this instantaneous factor is essential for a synergistic action between body and tumor radiation effects.

Modification of the tumor irradiation effect under

various metabolic conditions was also studied. Some animals were deprived of food and water before treatment and others were subjected to starvation following treatment. It was found that starvation before treatment increased tumor destruction, while starvation following treatment did not affect regression. When oxidizing agents, such as H_2O_2, were injected intravenously ten to twenty seconds prior to local tumor irradiation, tumor regression was greatly enhanced, but when hydrogen peroxide was injected following irradiation, tumor regression was not affected. The peroxide alone did not seem to affect tumor regression.

Tumors irradiated locally while the animal was breathing a high-oxygen-content atmosphere showed increased regression, while local irradiation during respiration in a low-oxygen, high-nitrogen atmosphere was followed by decreased tumor destruction.

Although, as pointed out above, no tumor regression occurred when whole-body irradiation was given and the circulation to the tumor was cut off, the results of local irradiation given to tumors to which the blood supply was clamped off were not significantly different from those in controls in which the blood supply was undisturbed.

D. S. CHILDS, JR., M.D.
Rochester, Minn.

Experimental Studies on Early Lens Changes After Roentgen Irradiation. III. Effect of X-Radiation on Mitotic Activity and Nuclear Fragmentation of Lens Epithelium in Normal and Cysteine-Treated Rabbits. Ludwig von Sallmann, with the technical assistance of Carmen M. Munoz and Edith Barr. Arch. Ophth. **47:** 305–320, March 1952.

In a continuation of his study of early lens changes after roentgen irradiation (Arch. Ophth. **45:** 149 and 431, 1951. Abst. in Radiology **57:** 925, 1951 and **58:** 479, 1952), the author found that exposure of the rabbit's eye to the beam of x-rays (1,500 r) was followed by almost complete disappearance of dividing cells thirty minutes after irradiation. This total inhibition lasted three to four days. Recovery of mitosis took place in the next four days and was succeeded by an overcompensating increase in the proportion of dividing cells, which could be observed for at least one more week.

Nuclear fragmentation and extrusion of Feulgen-positive material in the form of clumped chromatin globules began two hours after irradiation. There was a steep rise in the incidence of this sign of radiation injury when the inhibition of mitosis terminated, particularly when the overshooting phenomenon had fully developed. A relative depletion of cell elements, which was most striking in the equatorial zones, was considered a result of this nuclear fragmentation, which led characteristically to the liquefaction of cell bodies with vacuole formation.

Cysteine treatment of irradiated animals prolonged the inhibitory effect of x-rays on mitosis, slowed the speed of recovery, and reduced the extent of overshooting of cell division, particularly when the cysteine was injected prior to the exposure of the eye to 1,500 r.

The relative protective action of pretreatment with cysteine against x-ray damage of the lens was demonstrated in the author's study by a lower incidence of nuclear fragmentation in all zones of cysteine-pretreated eyes as compared with the incidence of this type of damage in the eyes of untreated irradiated rabbits and of rabbits treated after irradiation.

Ten photomicrographs; 2 charts; 5 tables.

Post-Irradiation Studies on Mammalian Testes. Effect at Hourly Intervals for First 24 Hours. Lloyd C. Fogg and Russell F. Cowing. Proc. Soc. Exper. Biol. & Med. **79:** 88–92, January 1952.

The present study is a continuation of an investigation of the changes in the testes following irradiation in mice (Cancer Research **11:** 23 and 81, 1951. Abst. in Radiology **58:** 323, 1952). The technic employed is that described in the earlier reports; it involves direct irradiation of the testes with the rest of the animal shielded. In the present investigation the testicles of mice were exposed to a single dose of 1,440 r (187 r per minute).

Quantitative data are presented to show the incidence of spermatogonia and spermatocytes in normal mouse testicles at stated intervals in a twenty-four-hour period. These data are compared with data for testicles of mice killed at hourly intervals through the twenty-four-hour period following irradiation.

The findings indicate that within the twenty-four hours a pattern of response can be demonstrated which is limited to the spermatogonia. Active mitosis is inhibited for at least the first twenty-four hours and resting spermatogonia decrease in incidence after twenty hours. Reticulated spermatogonial cells, resting and meiotic spermatocytes do not decrease during the interval studied. Supplementary effects of irradiation, as shown by a tabulation of the frequency of degenerating cells, confirm the belief that mitotic spermatogonia and resting spermatogonia are the most sensitive germinal cells. Degeneration of the reticulated spermatogonial cells does not result in a lowered incidence of these cells at any time in the twenty-four-hour period.

One photomicrograph; 2 tables.

Influence of Local X-ray Treatment on Development of Jaws in Young Axolotl (Siredon mexicanum). V. V. Brunst, E. A. Sheremetieva-Brunst, and F. H. J. Figge. Proc. Soc. Exper. Biol. & Med. **79:** 401–403, March 1952.

Lower or upper jaws of twenty- to sixty-day-old axolotls (salamanders) were locally irradiated with 2,000–4,000 r. Suppression of growth of treated jaws was observed in all instances. The irradiated jaw was a miniature copy of the normal jaw.

Tissue reaction of the irradiated jaw was evident twenty-three days after treatment with 4,000 r (primary acute reaction). The treated jaw at that time showed a typical degenerating giant-cell epithelium. The enamel epithelium disappeared and resorption of teeth was in progress. Thirty-four days after irradiation there remained small remnants of teeth in parts of treated jaws. At this time, when the resorption of teeth was almost completed, only a small retardation of growth of the jaw was observed. The degenerating giant-cell epithelium had disappeared and had been replaced with normal-appearing epithelium, which, however, was unable to produce new enamel organs. Fifty-days after irradiation, the retardation of growth of the jaws was clearly evident, and all remnants of teeth had completely disappeared. In the control (shielded) jaws of the same animals, the development of the teeth proceeded normally. It is concluded that the mechanisms of tooth formation and tooth maintenance are permanently destroyed by x-irradiation.

Eight photographs; 2 photomicrographs.

The Effect of Ionizing Radiations on the Broad Bean Root. Part X. The Dependence of the X-Ray Sensitivity on Dissolved Oxygen. John Read. Brit. J. Radiol. **25:** 89–99 February; 154–160, March 1952.

After a description of the methods of study, statistical reports of the effect of x-rays on the broad bean root under different conditions of oxygen supply are given.

No significant change from the normal was observed when irradiation was conducted under conditions of lowered oxygen tension. Oxygen added after irradiation under anaerobic conditions had no effect.

When oxygen was added to the water in which the roots were immersed during irradiation there was a multiplying effect on the dose which followed an "s" curve, with the maximum slope at about 5 c.c. per liter. The curve indicates that about three times the dose must be given in the absence of oxygen than with an oxygen tension of 20 c.c. per liter.

There was no observable change in the histologic appearances of the damage produced by radiation.

Nine graphs; 1 drawing; 5 tables.

SYDNEY J. HAWLEY, M.D.
Seattle, Wash.

Physical Explanation of Different Effects of the Time Factor on Biological Objects. Richard Kurt Kepp and Kurt Müller. Strahlentherapie **88:** 139–149, 1952. (In German)

A time factor (influence of time of irradiation) could not be observed on objects in metabolic rest, or if one ion-hit precipitated a full irreparable effect. The time factor is dependent also upon the biological condition of the irradiated object, *e.g.*, upon the number of cell mitoses. It may differ in various objects and tissues. "Physical time factor" refers to effects on objects which have been in constant physiological condition during irradiation. "Biological time factor" is the term if the biological condition of the object is changing during irradiation. Unlike the biological time factor, the effect of the physical time factor is not proved satisfactorily.

On human skin the time factor effect at low voltages is conspicuous below 20 r/min. It is minimal between rates of 20 r/min. and 100 r/min., and over 100 r/min. it could not be determined. Testings with the electron beam on human skin showed a more significant time factor effect even in very short radiation exposures. This would indicate a physical time factor effect.

The author offers a theory for the explanation of the physical time factor effect. Hits of ionization which do not produce an irreparable biological effect will be followed by partial recovery. The time interval which is required for manifestation of this recovery depends upon the reactivity of the irradiated object and upon the ionization density. If the radiation time is too short, a time factor cannot become manifest.

Malignant cells may be damaged by a smaller number of hits than healthy tissue. Radiation with less dense ionization may raise the selectivity by reduction of the dosage rate.

Two illustrations.

LEWIS L. HAAS, M.D.
Chicago, Ill.

Identification of Ferritin in Blood of Dogs Subjected to Radiation from an Atomic Detonation. Thomas J. Haley, M. R. Andem, Richard F. Riley, and I. Williams. Proc. Soc. Exper. Biol. & Med. **79:** 547–550, March 1952.

Studies on blood plasma samples obtained from 8 dogs subjected to a lethal dose of radiation from an atomic detonation revealed a material which, administered intravenously, lowered the rate of vasomotion and decreased the epinephrine sensitivity of the mesoappendix capillary bed of the normal rat. After its appearance in the blood, the concentration of this vasodepressor material decreased as a function of time. The authors believe this material fits the criteria established for ferritin. (Mazur, *et al.* J. Biol. Chem. **187:** 473, 485, 497, 1950).

Two tables.

Radiation Hazards of Atomic Energy. Marcus Oliphant. M. J. Australia **1:** 277–281, March 1, 1952.

This is the Roentgen oration, delivered at a meeting of the College of Radiologists (Australia and New Zealand) on Nov. 10, 1951, at Canberra. The author presents the usual observations on the dangers associated with the use of atomic energy.

Medical Problems in Atomic Exposure. George M. Lyon. Wisconsin M. J. **51:** 170–181, February 1952.

This paper on the medical aspects of atomic warfare covers the three types of injury to be observed: (1) mechanical injuries, which can be expected to account for at least two-thirds of the deaths; (2) thermal burns, including fire or flame burns and flash burns due chiefly to infra-red radiations; (3) radiation effects. The observations are similar to those repeatedly recorded in the recent literature.